



**Government of Karnataka  
Department of  
Collegiate Education**



**Government College**  
Kalaburagi – 585105  
(An Autonomous Institution)

**DEPARTMENT OF STATISTICS**

**COURSE MATRIX AND SYLLABUS  
OF B.SC I AND II SEMESTER**  
Framed according to the  
**STATE EDUCATION POLICY-2024-25**  
(EFFECT FROM 2024-25)

**Semester – I**  
**DSC-1S: Descriptive Statistics and Elements of Probability**

**Course Learning Objectives(CLOs)**

1. The main objective of the course is to equip students with the knowledge of types of statistical data, presentation of data, various measures of central tendency and dispersion to summarize and study the variation in the data, to study the relationship between variables and to understand the probability of events and its applications in real life problems.
2. To understand the Statistics subject and its applications in various fields, types of data and presentation of numerical data through diagrams and graphs.
3. To apply various measures of central tendency, dispersion, skewness and kurtosis to analyse statistical data.
4. To study the relationship between two or more variables through correlation and regression analysis.
5. To enable the students to understand the probability of various events and concept of Bayes theorem.

**Course Outcomes (COs)**

At the end of the course the student should be able to:

1. Get the knowledge of Statistics and its applications in various fields.
2. Get knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion.
3. Perceive the knowledge of correlation, regression analysis
4. Conceptualize the probabilities of events including frequentist and axiomatic approach and will learn the notion of conditional probability including the concept of Bayes' theorem.

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Content	Teaching Hrs	Credits
<b>UNIT I: Introduction to Statistics</b>	12	3
Statistics: Definition and scope. Concepts of statistical population and sample. Methods of sampling: SRS, Stratified, Systematic and Cluster sampling (Definitions only). Data: quantitative and qualitative, cross sectional and time-series, discrete and continuous. Scales of measurement: nominal, ordinal, interval and ratio. Classification, tabulation of data and diagrammatic representation of data. Frequency distributions, cumulative frequency distributions and their graphical representations. Stem and leaf displays.		
<b>UNIT II: Univariate Data Analysis</b>	12	
Measures of Central Tendency: Mean, weighted mean, trimmed mean, Median, Mode. Geometric and harmonic mean, properties, merits and demerits, relation between these measures. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation and their relative measures. Moments, Skewness and Kurtosis. Quintiles' and measures based on them.		
<b>Unit-III: Bivariate and Multivariate Analysis</b>	12	
Bivariate Data, Scatter diagram, Correlation, Karl Pearson's correlation coefficient, Rank correlation – Spearman's and Kendall's measures. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination.		
Analysis of Categorical Data: Contingency table, independence and association of attributes, measures of association - odds ratio, Pearson's and Yule's measure. Multivariate Data Visualization: Mean vector and Dispersion matrix, Multiple linear regression (Three variables only), and Residual variance. Multiple and partial correlation coefficients.		
<b>Unit-IV: Elements of Probability</b>	12	
Random experiment, sample space and events, algebra of events. Definitions of Probability- Classical, statistical, subjective and axiomatic approaches – illustrations and applications, Addition rule, Conditional probability, independence of events and multiplication rule, Total probability rule, Bayes theorem- applications.		

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## Books for Reference:

1. Agresti, A. (2010): Analysis of Ordinal Categorical Data, 2nd Edition, Wiley.
2. Freedman, D., Pisani, R. and Purves, R. (2014): Statistics, 4th Edition, W. W. Norton & Company.
3. Gupta, S.C. (2018): Fundamental of Statistics, Himaliya Publishing House, 7<sup>th</sup> Edition.
4. Gupta, S.C. and V.K. Kapoor (2020): Fundamental of Mathematical Statistics, Sultan Chand and Co. 12<sup>th</sup> Edition.
5. Johnson, R.A. and Bhattacharyya, G.K. (2006) Statistics: Principles and methods. 5th Edition, John Wiley & Sons, New York.
6. Medhi J. (1992): Statistical Methods : An Introductory Text. New Age.
7. Ross, S.M. (2014) Introduction to Probability and Statistics for Engineers and Scientists, 5<sup>th</sup> Edition, Academic Press.
8. Tukey, J.W. (1977) : Exploratory Data Analysis, Addison-Wesley Publishing Co.
9. T. W. Anderson and Jeremy D. Finn (1996): The New Statistical Analysis of Data, Springer.

## List of Practical Assignments

(Computing all the practical's manually and using MS Excel)

1. Presentation of data by frequency tables, diagrams and graphs, stem and leaf, partition values.
2. Arithmetic Mean (AM), geometric mean, harmonic mean, weighted AM, trimmed mean, corrected mean.
3. Mode, median, partition values.
4. Absolute and relative measures of dispersion, Box plots.
5. Problems on moments, skewness and kurtosis.
6. Product moment correlation coefficient and rank correlation.
7. Regression of two variables.
8. Multivariate Descriptive statistics- mean Vector, dispersion matrix, correlation matrix, Partial and Multiple correlations.
9. Problems on Association of attributes.
10. Problems on Probability

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## Semester – II

### **DSC-2S : Probability and Probability Distributions**

#### **Course Learning Objectives (CLOs)**

1. To understand the concepts of random variable , expectation of random variable , standard discrete and continuous distributions, and R programming.
2. To understand the concept of random variable and expectation of random variable.
3. To acquire knowledge of standard discrete distribution and their applications.
4. To study standard continuous distributions and their applications in real life problems.
5. To expertise student in R programming for data analysis.

#### **Course Outcomes (COs)**

1. Learn concept of discrete and continuous random variables and their probability distributions including expectation and moments.
2. Able to understand and gain practical knowledge of discrete probability distributions.
3. Able to understand and gain practical knowledge of Continuous probability distributions
4. Gain practical knowledge of R programming in drawing diagrams and graphs, for evaluating probabilities and probability distributions.

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Content	Teaching Hrs	Credits
<b>UNIT I: Random Variables and Mathematical Expectation (One Dimension)</b>	12	3
Definitions of discrete and continuous random variables, distribution function, probability mass and density functions – properties and illustrations. Expectation of random variable and its properties. Probability generating function, Moments and moment generating function and cumulant generating function-properties and uses.		
<b>UNIT II: Standard discrete distributions</b>	12	
Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial, Hyper geometric distributions, definition, mean, variance, moments, moment generating functions, recurrence relation for probabilities and moments for binomial, Poisson, and Negative binomial distributions, additive property, Cumulant generating function, theoretical examples.		
<b>Unit-III: Standard Uni-variate continuous distributions</b>	12	
Rectangular, Beta, Gamma, and Exponential distributions, definitions through p.d.f's, Mean, variance, moments, recurrence relations, Additive property of exponential and gamma variates, Normal distribution and its properties, Cauchy distribution, Uni-variate and Bi-variate transformation of variables of discrete and continuous random variables.		
<b>Unit-IV: Data Analysis Using R</b>	12	
Introduction to R: Installation, command line environment, overview of capabilities, brief mention of open source philosophy. R as a calculator: The four basic arithmetic operations. Use of parentheses nesting up to arbitrary level. The power operation. Evaluation of simple expressions. Quotient and remainder operations for integers. Standard functions, e.g., sin, cos, exp, log. The different types of numbers in R: Division by zero leading to Inf or -Inf. NaN. NA. No need to go into details. Variables. Creating a vector using c(), seq() and colon operator. How functions map over vectors. Functions to summarize a vector: sum, mean, sd, median etc. Extracting a subset from the vector (by index, by property). R as a graphing calculator: Introduction to plotting. Plot(), lines(), abline(). No details about the graphics parameters except colour and line width. Barplot, Pie chart and Histogram. Box plot. Scatter plot and simple linear regression using lm(y~x). Problems on discrete and continuous probability distributions.		

### Books for Reference :

1. Dudewicz. E.J. and Mishra.S.N. (1998), Modern Mathematical Statistics. John Wiley.
2. Goon A.M., Gupta M.K., Das Gupta .B. (1991), Fundamentals of Statistics, Vol. I, World Press, Calcutta.
3. Gupta. S.C and V.K. Kapoor (2020), Fundamentals of Mathematical Statistics, Sultan Chand and Co, 12<sup>th</sup> Edition.
4. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, Seventh Edition, Pearson Education, New Delhi.
5. Mood, A.M., Graybill, F.A. and Boes, D.C. (2007), Introduction to the Theory of Statistics, 3rd Edition. (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
6. Ross, S. (2002), A First Course in Probability, Prentice Hall.
7. Sudha G.Purohit, Sharad D. Gore, Shailaja R Deshmukh,(2009), Statistics Using R, Narosa Publishing House.
8. R for beginners by Emmanuel Paradis (freely available at [https://cran.r-project.org/doc/contrib/Paradisrdebut\\_en.pdf](https://cran.r-project.org/doc/contrib/Paradisrdebut_en.pdf))

### List of Practical Assignments

(Computing all the practicals manually and using R)

1. Demonstration of R programming for various tools used in univariate data
2. Demonstration of R programming for various tools used in bivariate data.
3. Plotting pmf and sketching of pdf.
4. Problems on expectation, variance, quantiles, skewness, kurtosis (Discrete Case).
5. Problems on pdf, expectation, variance, quantiles, skewness, kurtosis (Continuous case).
6. Computation of moments and Moment generating functions (Discrete and Continuous Case) and extraction of probabilities probability generating function.
7. Problems on discrete probability distributions (Rectangular, Binomial, Poisson and Geometric distributions).
8. Problems on Normal probability distributions.
9. Fitting of distributions Binomial, Poisson, Geometric distributions.
10. Fitting of distributions Exponential and Normal distributions.

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## Continuous Assessment Programme/Internal Assessment/Formative Assessment

### Major Courses

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
(1)	(2)	(3)
01	Two Session Tests with proper record for assessment (5+5 = 10)	10
02	Assessment of Skill Development activities/Seminars/Group Discussion/Assignment etc., with proper record	05
03	• Attendance with proper record	05
<b>TOTAL MARKS</b>		<b>20</b>

#### • Attendance Marks-breakup

<75%	-	00 Marks
75-80%	-	01 Mark
80-85%	-	02 Marks
85-90%	-	03 Marks
90-95%	-	04 Marks
>95%	-	05 Marks

### Practical Examination

**Duration: 3Hrs**

- Practical Examination - 30 Marks
- Viva Voce - 10 Marks

**Total - 40 Marks**

### Internal Assessment for Practical Paper

- Attendance - 05 Marks
  - Record /Journal - 05 Marks
- Total - 10 Marks**

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