POORNAPRAJNA COLLEGE (AUTONOMOUS), UDUPI

NAAC Re-Accredited "A+" (3.27 CGPA)

(Promoted and Managed by Udupi Shree Adamaru Matha Education Council, Bengaluru)

SYLLABUS FOR UNDER GRADUATE PROGRAM (UG) OF STATISTICS
CURRICULUM FRAMEWORK

Course pattern and scheme of examination for UG Courses

FRAMED ACCORDING TO THE
STATE EDUCATION POLICY (SEP 2024)

BACHELOR OF SCIENCE

STATISTICS

I & II SEMESTERS

TO IMPLEMENT FROM THE ACADEMIC YEAR 2025-26

BOARD OF STUDIES IN STATISTICS

POORNAPRAJNA COLLEGE (AUTONOMOUS),

UDUPI - 576101

Programme Outcomes(POs)

By the end of the program the students will be able to:

1. Acquire fundamental/systematic or coherent understanding of the academic field of Statistics and its Different learning areas and applications.
2. Develop and demonstrate an ability to understand major concepts in various disciplines of Statistics.
3. Demonstrate the ability to use skills in Statistics and different practicing areas for formulating and tackling Statistics related problems and identifying and applying appropriate principles and methodologies to solve a wide range of problems associated with Statistics.
4. Understand procedural knowledge that creates different types of professionals related to subject area of Statistics, including professionals engaged in government/public service and private sectors.
5. Plan and execute Statistical experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate statistical software Including programming languages, and report accurately the findings of the experiment/investigations.
6. Have a knowledge regarding use of data analytics tools like Excel and R-programming.
7. Develope ability to critically assess a standard report having graphics, probability statements.

Course Outcomes (Cos) for I and II Semester

At the end of I and II semester courses the students should be able to:

1. Acquire knowledge of introductory statistics,its scope and importance in various area such as Medical, Engineering, Agricultural and social science etc.
2. Learn various types of data, their organization and descriptive statistics such as representation in tabular form graphs and summery measure such as measures of central tendency and dispersion etc.
3. Learn correlation, curve fitting, regression analysis, regression diagnostics, partial and Multiple correlation.
4. Learn different types of data reflecting independence and association between two or more attributes.
5. Learn basics of R-programming and able to write and execute R codes in descriptive statistics, probability models, fitting of suitable distributions to the given dataset, applications on normal and other distributions.
6. Conceptualize the probabilities of events including frequencies of axiomatic approach. Simultaneously, they will learn the notation of conditional probability including the concept of Bayes theorem and able to solve problems on these topics.
7. Learn the concept of discreate and continuous random variables and their probability distributions including expectations and moments.

8. Learn standard univariate discreate and continuous distributions and their applications in other disciplines of science.

Practical Examination:

1) Students will have to answer any four questions out of 8 questions. All questions carry equal marks.

2) Practical paper in each semester carries 50 marks and the split up of the practical marks are as given below.

a) Three hour examination with two examiners which includes at least one external examiner carries 30 marks.

b) Ten marks for class records.

c) Ten marks to be allotted for the Internal practical examination.

Scheme of Evaluation for Internal Assessments Marks

Assessment Type	**Weightage in Marks**
Internal Test I	10
Internal Test II	10
Total	**20**

Scheme of Teaching and Evaluation for B.Sc. Programme

I SEMESTER

	Course Code	Particulars	Instruction hours/week	Duration of the exam (hrs)	Max.Marks			Credits
					IA	Exam	Total	
Group I Core Subject	BSSTCS101	Descriptive Statistics	4	3	20	80	100	3
	BSSTPS101	Statistics Practical - I	4	3	10	40	50	2

II SEMESTER

	Course Code	Particulars	Instruction hours/week	Duration of the exam (hrs)	Max.Marks			Credits
					IA	Exam	Total	
Group I Core Subject	BSSTCS201	Probability Theory and Probability Distributions	4	3	20	80	100	3
	BSSTPS201	Statistics Practical - II	4	3	10	40	50	2

SYLLABUS FOR I SEMESTER

UNDERGRADUATE COURSES

SEMESTER SCHEME 2025-26 ONWARDS

DESCRIPTIVE STATISTICS – BSSTCS101

4 Hours per week **56 Hours**

COURSE CONTENTS

Module	Particulars	No.of Hours
Module 1	**Introduction to Statistics** Statistics: Definition and scope. Data: quantitative and qualitative, cross-sectional and time series, discrete and continuous. Scales of measurement: nominal, ordinal, interval and ratio. Presentation of data: tabular and graphical. Frequency distributions, cumulative frequency distributions and their graphical representations. Stem and leaf displays. Concepts of population and sample. Different methods of data collection:- SRS, Stratified,Systematic and Cluster sampling methods: definitions only.	**10 Hours**
Module 2	**Univariate Data Analysis** Concept of measures of central tendency: Mean, weighted mean, trimmed mean, Median, Mode, Geometric and harmonic means, properties, merits and limitations, relation between these measures. Partition Values: Quartiles, Deciles and Percentiles. Measures of Dispersion: Range, Quartile deviation ,Mean deviation, Variance, Standard deviation and their relative measures. Moments, Skewness and Kurtosis. Outliers, Box Plot.	**18 Hours**
Module 3	**Bivariate Data Analysis** Bivariate Data, Correlation: Scatter plot, Karl Pearson' s correlation coefficient, Spearman' s rank correlation coefficient, properties and results. Curve fitting, concept of errors, principle of least squares, fitting of polynomial and exponential curves. Analysis of Categorical Data: Contingency table, independence and association of attributes, measures of association- odds ratio, Pearson' s and Yule' s measure.	**18 Hours**
Module 4	**Statistical computing (R Software)** Introduction to R, R as a calculator, statistical software and a programming language, R preliminaries, getting help, data inputting methods(direct and importing fromother spread sheet applications like Excel), data accessing, and indexing, packages, Graphics in R, built in functions, saving, storing and retrieving work. Descriptive statistics: diagrammatic representation of univariate and bivariate data (box plots, stemand leaf diagrams, bar plots, pie diagram),measures of central tendency (mean,median andmode), partition values ,measures of dispersion (range, standard deviation, mean deviation and inter quartile range), summaries of a numerical data, skewness and kurtosis.	**10 Hours**

Learning Outcome:

At the end of the course students will able to:

- Understand the scope, role, and relevance of statistics in scientific inquiry and real-world contexts.
- Identify different types of data and apply appropriate methods for their classification and summarization.
- Compute and interpret key descriptive statistics, including measures of central tendency and dispersion.
- Explore relationships between variables through correlation analysis.
- Using R software for importing, organizing, summarizing, and visualizing data

References:

1. Agresti,A.(2010).Analysis of Ordinal Categorical Data,2nd Edition,Wiley.
2. Anderson T.W. and Jeremy D. Finn (1996).The New Statistical Analysis of Data, Springer
3. Gupta, S. C. (2018). Fundamentals of Statistics, Himalaya Publishing House, 7th Edition.
4. Gupta S.C. and V.K. Kapoor (2020). Fundamentals of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
5. Hogg, R. V. McKean J. W. and Craig, A. T. (2012). Introduction toMathematical Statistics, Pearson 7th Edition.
6. Johnson, R.A. and Bhattacharyya, G.K. (2006). Statistics: Principles andmethods. 5th Edition, JohnWiley&Sons, New York.
7. Medhi, J.(2005).Statistical Methods, NewAge International.
8. Ross, S.M. (2014). Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.
9. Tukey, J.W.(1977). Exploratory Data Analysis, Addison-Wesley Publishing Co.
10. Sudha G. Purohit, Sharad D. Gore, Shailaja R Deshmukh,(2009). Statistics Using R, Narosa Publishing House.
11. Emmanuel Paradis(2005). R for Beginners (available at https://cran.rproject.org/doc/contrib/Paradisrdebuts_en.pdf)

Theory Question paper pattern

Scheme of Examination (For 80 Marks)			
		Questions to be attended	Marks
1	Part A	Ten questions out of 12 questions	10X2=20
2	Part B	Five questions out of 8 questions	5X6=30
3	Part C	Three questions out of 5 questions Each question may have sub questions	3X10=30

FIRST SEMESTER

Statistics Practical -I

Descriptive Statistics - BSSTPS101

List of Practical Assignments

1. Presentation of data by frequency tables, diagrams and graphs.
2. Arithmetic Mean (AM), geometric mean, harmonic mean, weighted AM
3. Median ,mode and partition values.
4. Quartile deviation, mean deviation- absolute measures and relative measures
5. Standard deviation, coefficient of variation and, combined variance
6. Problems on moments, skewness and kurtosis.
7. Fitting of curves by least squares method.
8. Product moment correlation coefficient and rank correlation.
9. Problems on Association of attributes.
10. Statistical Computing using R software- Descriptive Statistics.

SYLLABUS FOR II SEMESTER

UNDERGRADUATE COURSES

SEMESTER SCHEME 2025-26 ONWARDS

PROBABILITY THEORY AND PROBABILITY DISTRIBUTIONS – BSSTCS201

4 Hours per week **56 Hours**

COURSE CONTENTS

Module	Particulars	No.of Hours
Module 1	**Probability** Random Experiments, Sample space, Elementary events and compound events, Algebra of events, Classical definition of probability and its limitations, relative frequency approach. Axioms of probability, Deduction of classical definition from Axiomatic definition and other results. Addition theorem, Conditional Probability and Independence, Multiplication theorem, Bayes' Theorem (with proof) and its applications.	**10 Hours**
Module 2	**Random Variables** Random variables (discrete and continuous), properties, probability mass function, probability density function their properties, probability distribution function -properties. Joint density functions, marginal density functions and conditional density functions. Expectation of random variables - rules of expectation, addition and multiplication theorems of expectation, variance, covariance and correlation. Mean and covariance of linear combination of random variables, moments, measures of location and dispersion - skewness and kurtosis of a random variable, moment generating function (MGF). and its properties, cumulant generating function (CGF), cumulants. Tchebycheff' s inequality.	**15 Hours**
Module 3	**Standard Discrete Probability distributions** Bernoulli, Binomial, Poisson, discrete uniform, Geometric, Negative Binomial, Hyper geometric distributions- definition through pmf. - Mean, Variance, MGF, CGF, Recurrence relation between moments, Properties, Inter relationships.	**15 Hours**
Module 4	**Standard Continuous Probability distributions** Uniform, exponential, gamma (one parameter and two parameters), beta (first kind and second kind), Cauchy, normal- definition through p.d.f., mean, variance, m.g.f, c.g.f, moments and properties.	**16 Hours**

Learning Outcome:

At the end of course students will able to:

- Understand and apply different interpretations of probability and solve problems using probability rules.
- Define and distinguish between discrete and continuous random variables and their associated functions (PMF, PDF, CDF).
- Calculate expectations, variances, and other moments, and understand their role in describing distributions.
- Derive and apply properties of standard discrete and continuous distributions to model real-world problems.

References:

1. Dudewitz. E. J. andMishra.S.N.(1998).Modern Mathematical Statistics. JohnWiley.
2. Goon A.M., Gupta M. K. ,Das Gupta.B. (1991), Fundamentals of Statistics, Vol. I,World Press, Calcutta.
3. Hogg R, V.,Mckean J.W, and Craig, A.T (2019). Introduction tomathematical Statistics,8th Edition, Pearson Education, New Delhi.
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.

Theory Question paper pattern

Scheme of Examination (For 80 Marks)			
		Questions to be attended	Marks
1	Part A	Ten questions out of 12 questions	10X2=20
2	Part B	Five questions out of 8 questions	5X6=30
3	Part C	Three questions out of 5 questions Each questions may have sub questions	3X10=30

SECOND SEMESTER

Statistics Practical -II

Probability Theory and Probability Distributions-BSSTPS201

List of Practical Assignments

1) Probability- Addition theorem, multiplication theorem and conditional probability.

2) Probability- Bayes' theorem.

3) Random variables (Univariate), pmf, pdf and Distribution functions, mean and variance.

4) Bivariate Probability Distributions - Conditional Mean, Conditional Variance, Correlation and Tchebycheff' s inequality.

5) Exercise on Binomial distribution.

6) Exercise on Poisson distribution.

7) Exercise on Geometric, Negative Binomial and, Hyper geometric distribution.

8) Exercise on normal distribution.

9) Exercise on exponential distribution.