ಬೆಂಗಳೂರು ನಗರ ವಿಶ್ವವಿದ್ಯಾಲಯ
BENGALURU CITY UNIVERSITY
ಹಗುರ ಲೇ ಅನಿಕೇತಾ
BE BOUNDLESS

BENGALURU CITY UNIVERSITY
Department of Statistics

Central College Campus Bengaluru – 560 001

Approved Syllabus for
I & II Semester Statistics Under-Graduate (UG) Program

Framed according to the State Education Policy -SEP 2024

BENGALURU CITY UNIVERSITY
BOARD OF STUDIES IN STATISTICS

Proceedings of the meeting of Board of studies in Statistics held at 2:00 pm on 18-07-2024 in the Department of Statistics, Jnana Bharathi Campus, Bangalore University, Bengaluru

The meeting started with welcome of the members by the Chairperson of the board of studies.

The following decisions were taken.

1. The members discussed and approved the syllabus for I and II semesters of UG major Statistics as per SEP 2024 guidelines.
2. The panel of examiners for B Sc examinations for the year 2024-25 is approved.

Members Present:

1.	Sri R.Prakash Head and Associate Professor of Statistics Vijaya College, R.V.Road, Basavanagudi, Bangalore 560 004.	R.Prakash 18/7/2024
2.	Dr. Lakshmi S.K. Dean, faculty of Science,Mount Carmel College (Autonomous),Palace Road, Bangalore 560 052	18/7/24
3.	Sri Narayana Gowda.G Assistant Professor of Statistics, Reva University , Kattigenahally, Jala Hobli,Yelahanka Bangalore 560 064.	
4.	Smt Ambika.C Head, Department of Statistics, Mount Carmel College (Autonamous),Palace Road, Bangalore 560 052	
5.	Dr. Raveendra Naika. T. Associate Professor of Statistics Maharani's Cluster University, Palace Road, Bangalore 560 001	18/7/24
6.	Dr. Mohana kumari, C. Assistant Professor of Statistics Mount Carmel College (Autonomous) No.58,Palace Road, Bangalore 560 052	
7.	Dr. Parameshwar V Pandit, - Chairperson, BOS Senior Professor and Chairperson, Department of Statistics Bangalore University, Bengaluru	

Dr. Parameshwar V. Pandit
Senior Professor & Chairman
Department of Statistics
Bangalore University
Bengaluru - 560 056.

BENGALURU CITY UNIVERSITY

Regulations and Syllabus

for

STATISTICS

in

Three Year BSc Course (SEP 2024)

Eligibility

1. Only those candidates who have passed Pre-University course or an equivalent course with Statistics /Mathematics/ Basic Mathematics/Applied Mathematics as one of the optional subjects are eligibleto take Statistics as one of the optional subjects in BSc course.
2. Any student taking Statistics as one of the optional subjects in the BSc course shall take Mathematics as another optional subject.

Scheme of Instruction

1. The subject of Statistics in this course has to be taught by MSc/MA degree holders in Statistics / Applied Statistics.
2. The theory question paper for each paper shall cover all the topics in the pertaining syllabus with proportional weightage to the number of hours of instruction prescribed.
3. The practicals are to be conducted in batches as per the University norms for the faculty of science (normally 10 students per batch per teacher).
4. Two teachers are to be assigned for each batch with not more than 20 students for giving instructions, supervision, and correction of records.
6. It is expected that each student collects and uses real life data for the practical classes.
7. Students are required to use Statistical software, run the program , and enclose computer outputs to the practical records in the case of computer based practicals.
8. Maximum marks for each record in the examination is 5.
9. Study tour for the students is strongly recommended to gain practical knowledge of applications of Statistics in Industries/Agriculture/Medical field.

Program Outcomes (Pos):

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

PO1. Acquire fundamental / systematic or coherent understanding of the academic field of Statistics and its different learning areas and applications.

PO2. Develop and demonstrate an ability to understand major concepts in various disciplines of Statistics.

PO3. 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.

PO4. 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.

PO5. 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.

PO6. Have a knowledge regarding use of data analytic stools like Excel and R-programming.

PO7. Developed ability to critically assess a standard report having graphics, probability statements.

PO8. Analyse, interpret the data and hence help policy makers to take a proper decision.

PO9. Recognize the importance of statistical modelling and computing, and the role of approximation and mathematical approaches to analyse the real problems using various statistical tools.

PO10. Demonstrate relevant generic skills and global competencies such as

(i) Problem-solving skills that are required to solve different types of Statistics related problems with well- defined solutions, and tackle open-ended problems, that belong to the disciplinary-area boundaries;

(ii) Investigative skills, including skills of independent thinking of Statistics-related issues and problems;

(iii) Communication skills involving the ability to listen carefully, to read texts and reference material analytically and to present information in a concise manner to different groups / audiences of technical or popular nature;

(iv) Analytical skills involving paying attention to details and ability to construct

logical Arguments using correct technical language related to Statistics and ability to translate them with popular language when needed;

(v) Personal skills such as the ability to work both independently and in a group.

PO11. Undertake research projects by using research skills –preparation of questionnaire, conducting national sample survey, research projects using sample survey, sampling techniques.

PO12. Understand and apply principles of least squares to fit a model to the given data, study the association between the variables, applications of Probability Theory and Probability Distributions.

COURSE MODEL:

SEM	COURSE TITLE	THEORY/ PRACTICAL HOURS PER WEEK	DURATION OF EXAM	CIA MARKS	ESE MARKS	TOTAL	CREDITS
I	STT101: BASICSTATISTICS-I	04	03	20	80	100	3
	STP101: PRACTICAL-I	03	03	10	40	50	2
II	STT201: BASICSTATISTICS-II	04	03	20	80	100	3
	STP201: PRACTICAL -II	03	03	10	40	50	2

CIA-Continuous Internal Assessment
ESE-End Semester Examination

CURRICULUM FOR THE UNDER-GRADUATE PROGRAM IN STATISTICS (SEP)

Program Name	**B.Sc. Statistics**	Semester	**I**
Course Title	**BASICSTATISTICS -I**		
Course Code	**STT101**	No. of Credits	**3**
Contact Hours	**60**	Duration of End Sem Exam	**3 Hours**
Continuous Internal Assessment (CIA) Marks	**20**	End Semester Exam (ESE) Marks	**80**

Course Pre-requisites

Course outcomes (COs): After the successful completion of the course, the student will be able to have

CO1. Knowledge of introductory statistics, its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.
CO2. Knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.
CO3. Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.
CO4. Conceptualize the probabilities of events including frequents and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem.
CO5. Knowledge on R-programming in the descriptive statistics and probability models.

Contents	**60 Hours**
UNIT 1: INTRODUCTION TO STATISTICS Statistics: Meaning, importance and scope of Statistics, Basic concepts and Types of data, Collection of data - primary and secondary data, Questionnaire and schedule, Census and Sampling, Types of sampling, Classification and tabulation, frequency distribution, construction of frequency distribution, Diagrammatic and graphical representation of data, stem and leaf chart	**15 Hours**
UNIT 2: UNIVARIATE DATA ANALYSIS Measures of central tendency: Arithmetic mean, weighted mean, median, mode, geometric mean and harmonic mean, their properties, merits and demerits. Relation between these measures. Quartiles. Measures of dispersion: absolute measures - range, quartile deviation, mean deviation, standard deviation and their properties, relative measure - coefficient of variation and their properties. Moments – raw and central moments, Relation between them. Skewness and Kurtosis – their measures and properties.	**15 Hours**
UNIT 3: BIVARIATE AND TRIVARIATE DATA ANALYSIS Curve fitting – Principle of least square, Fitting of linear equation, exponential and geometric curves, Concept of errors, Principal of least squares. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination. Bivariate Data, Scatter plot, Correlation, Karl Pearson's correlation coefficient,	**15 Hours**

Spearman's rank correlation coefficient. properties. Multiple linear regression (three variables only), multiple and partial correlation coefficients, Residual error variance.	
UNIT 4: PROBABILITY THEORY AND STATISTICAL SOFTWARE Random experiment, trial, sample space and events. Classical, empirical and axiomatic approaches to probability – illustrations and applications. Addition rule, Conditional probability, independence of events and multiplication rule. Total probability rule, Bayes' theorem- applications. Computer software and utility, statistical software, MS-EXCEL, R Software – advantages, expressions and objects, Functions and arguments, matrices and arrays, factors, data frames, graphs.	**15 Hours**

Course Title	**Practical-I: BASIC STATISTICS -I**		
Course Code	**STP101**	Practical Credits	**2**
Contact Hours	**60**	Duration of End Sem Exam	**3 Hours**
Continuous Internal Assessment (CIA) Marks	**10**	End Semester Exam (ESE) Marks	**40**

Practical Content
(DEMONSTRATION OF PRACTICALS USING MS-EXCEL and R)

1. Construction of frequency distribution and graphical representation.
2. Measures of Central Tendency I (AM,GM,HM, Combined mean and Weighted means)
3. Measures of Central Tendency II (Median, Mode and quartiles)
4. Measures of Dispersion (Range, Standard deviation, Mean deviation, Quartile deviation and Coefficient of variation).
5. Moments, Skewness and Kurtosis for a frequency distribution.
6. Correlation and regression for ungrouped data and Spearman's rank correlation coefficient.
7. Curve fitting- Fitting of linear equation, exponential and geometric curves,
8. Trivariate data-Computation of multiple and partial correlation coefficients
9. Computation of probability using Computation of probability using combinatorial methods, addition and multiplication theorem.
10. Application of conditional probability, Bayes' theorem.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes(POs 1-12)

Course Outcomes (COs)	**Program Outcomes(POs)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**1**						**1**			**1**	
CO2		**1**			**2**			**1**		**1**		
CO3					**1**	**2**			**1**			**1**
CO4		**1**			**1**		**2**					
CO5			**1**			**2**	**1**			**1**		

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Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

REFERENCES

1. Anderson T.W. and Jeremy D. Finn(1996).The New Statistical Analysis of Data, Springer.
2. Freedman, D., Pisani, R. and Purves, R(2014), Statistics,4th Edition, W.W. Norton & Company.
3. Goon A.M., Gupta M.K., Das Gupta. B.(2013): Fundamentals of Mathematical Statistics, Vol.I, World Press, Calcutta.
4. Gupta, S.C. (2018), Fundamental of Statistics, Himalaya PublishingHouse.
5. Goon A.M., Gupta M.K., Das Gupta. B.(2013): Fundamentals of Mathematical Statistics, Vol.I, World Press, Calcutta.
6. Gupta, S.C. (2018), Fundamental of Statistics, Himalaya PublishingHouse,7thEdition.
7. Hogg, R.V. McKean J.W. and Craig, A. T. (2021), Introduction to Mathematical Statistics, Pearson 10thEdition.
8. Joao Moreira, Andre de Carvalho, Tomas Horvath (2018), General Introduction to Data Analytics, Wiley.
9. Johnson, R.A. and Bhattacharyya, G.K. (2006), Statistics: Principles and methods. 5th Edition, John Wiley & Sons, New York.
10. Johnson, R. A. and Wichern, D.W.(2013). Applied Multivariate Statistical Analysis, Pearson.
11. Medhi, J. (2006), Statistical Methods, New Age International, Delhi.
12. Montgomery, D.C. and Peck, E. A(2012). Introduction to Linear Regression Analysis, 5th Edition, Wiley.
13. Sudha G. Purohit, Sharad D. Gore, Shailaja R Deshmukh, (2009): Statistics Using R, Narosa Publishing House.
14. R for beginners by Emmanuel Paradis (freely available at https://cran.r-project.org/ doc/contrib/ Paradisrdebuts_en.pdf)

Program Name	**B.Sc. Statistics**	Semester	**II**
Course Title	**BASIC STATISTICS -II**		
Course Code	**STT201**	No. of Credits	**3**
Contact Hours	**60**	Duration of End Sem Exam	**3 Hours**
Continuous Internal Assessment (CIA) Marks	**20**	End Semester Exam (ESE) Marks	**80**

Course Pre-requisites

Course outcomes (COs): After the successful completion of the course, the student will be able to have

CO1. Knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments.
CO2. Knowledge of important discrete distributions such as binomial, Poisson, negative binomial, geometric and hypergeometric distributions.
CO3. Knowledge of important continuous distributions such as normal, gamma and beta distributions.
C04. Knowledge of convergence of distributions.
C05. Knowledge of generate random variables from various distributions

Contents	**60 Hours**
UNIT 1: RANDOM VARIABLES - (ONE DIMENSION AND TWO DIMENSION) **ONE DIMENSION:** Discrete and continuous random variables, Distribution function, probability mass and density functions – properties and illustrations, Expectation & variance of a random variable and rules of expectation and related results, Moments and moment generating function – properties and uses. **TWO DIMENSION:** Joint, marginal and conditional distributions, Independence of random variables, Moments, covariance and correlation coefficient, Addition and multiplication rules of expectation, Mean and variance of linear combination of random variables, Moment generating function(m.g.f.)-properties.	**15 Hours**
UNIT 2: DISCRETE PROBABILITY DISTRIBUTIONS Discrete uniform, Bernoulli, Binomial, Poisson, Negative-Binomial distributions -mean, variance, and m.g.f. ,recurrence relations for moments of Binomial and Poisson distributions, additive property of Binomial, Poisson distributions, geometric distribution – mean ,variance, Lack of memory property . Hyper geometric distribution– mean.	**15 Hours**

UNIT 3: CONTINUOUS PROBABILITY DISTRIBUTIONS Uniform, Gamma, Beta, Exponential distributions – definition through p.d.f.s, mean, variance, moments and m.g.f. Additive property of Exponential and Gamma variates. Lack of memory property of Exponential distribution, Normal distribution: Chief characteristics of normal distribution , Standard normal distribution-definition, median, mode, odd and even ordered moments and m.g.f, linear combination of normal variates.	**15 Hours**
UNIT 4: LIMIT THEOREMS AND SIMULATION: Chebyschev's inequality – proof and its use in approximating probabilities for various discrete and continuous distributions Convergence of Binomial, Poisson, Gamma distributions to Normal distribution. Statement of central limit theorem and its applications. **Introduction to simulation**. Monte Carlo method. Generation of random observations from binomial, Poisson, uniform, exponential, Normal, distributions, simple illustrations.	**15 Hours**

Course Title	**Practical-II: BASIC STATISTICS -II**		
Course Code	**STP201**	Practical Credits	**2**
Contact Hours	**60**	Duration of End Sem Exam	**3 Hours**
Continuous Internal Assessment (CIA) Marks	**10**	End Semester Exam (ESE) Marks	**40**

Practical Content
(DEMONSTRATION OF PRACTICALS USING MS-EXCEL and R)

1. Univariate probability distribution : Expectation, moments, skewness and kurtosis.
2. Bivariate Probability Distribution - 1: Moments and correlation coefficient.
3. Applications of Binomial distribution and fitting of binomial distribution.
4. Applications of Poisson distribution and fitting of Poisson distribution.
5. Computation of probabilities based on Negative Binomial, Geometric, Hyper geometric distributions.
6. Applications of Normal Distribution
7. Fitting of Normal distribution.
8. Rectangular and Exponential Distributions – Applications.
9. Applications of Chebyschev's inequality
10. Generating random numbers from discrete and continuous distributions using simulation.

Course Articulation Matrix: Mapping Course Outcomes (COs) with Program Outcomes(POs 1-12)

Course Outcomes (COs)	**Program Outcomes(POs)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**1**					**1**		**1**			**1**
CO2	**2**	**1**			**2**		**1**		**1**			**1**
CO3			**1**		**1**				**2**			**2**
CO4	**1**	**1**		**1**		**1**	**1**					**1**
CO5	**2**	**1**		**1**		**1**	**1**					**1**

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Pedagogy: The course is taught using traditional chalk and talk method using problem solving through examples and exercises along with interactive lectures, blended learning and case studies.

REFERENCES

1. Balakrishnan, N., Koutras, M.V. and Politis, K.G. (2019): Introduction to Probability: Models and Applications, Wiley.
2. Dudewicz.E.J.and Mishra.S.N. (1998): Modern Mathematical Statistics. John Wiley.
3. Goon A.M., Gupta M.K., Das Gupta .B. (2013): Fundamental of Statistics, Vol.I, World Press, Calcutta.
4. Gupta. S.C. and Kapoor, V.K. (2020): Fundamental of Mathematical Statistics, Sultan Chand and Co.,12th edition.
5. Hogg. R.V. and Craig. A.T. (2021): Introduction to Mathematical Statistics – 5/e, Prentice Hall, New Jersey, USA.10th edition.
6. Medhi J. (2006): Statistical Methods: An Introductory Text, New Age.
7. Mood, A.M. and Graybill, F.A. and Boes, D.C. (1974); Introduction to the theory of Statistics, McGraw-Hill.
8. Mukhopadhyay. P. (1996): Mathematical Statistics, Calcutta Publishing House.
9. Prakash Rao, B.L.S. (2020): A First Course in Probability and Statistics, World Scientific.
10. Ross S.M (2003): Introduction to Probability Models. 10/e, Academic Press, UK
11. Walpole, R.E and Myers, R.H and Myers, S.L (2017): Probability and Statistics for Engineers and Scientists, 9/e, Pearson, New Delhi.

Scheme for Theory and Practicals

(Effective from 2024-2025) Scheme SEP

COURSE MODEL

Distribution of Internal Marks for Internal Assessment (Theory)

Internal assessment for 20 marks comprises of performance in the tests, assignment and seminar

Sl.No.	Head	Marks
1	Two internal tests for 5 marks each	10
2	Assignment	05
3	Seminar	05
Total		20

Distribution of Internal Marks for Internal Assessment (Practical)

Internal assessment for 10 marks comprises of performance in the tests, submission of practical record and attendance.

Sl.No.	Head	Marks
1	One mock test	05
2	Internal viva	05
Total		10

Scheme for Theory Examination: 80 Marks
B.Sc. Degree Examination, 2024
Scheme SEP
Subject: STATISTICS

Time: 3 hours **Max. Marks -80**

SECTION - A

I **Answer any TEN of the following questions** **(10 x 3 = 30)**

(Answer any 10 out of 12 questions)

Number of question 12, from 1 to 12

SECTION - B

II **Answer any FIVE of the following questions** **(5x 10 = 50)**

(Answer any 5 out of 8 questions)

Number of question 5, from 13 to 20

Scheme for Theory Examination: 80 Marks

Unit	Section A 3 Marks	Section B 10 Marks	Total Marks
Unit - I	3	2	29
Unit - II	3	2	29
Unit - III	3	2	29
Unit - IV	3	2	29
Total	**10x3=30 marks** **(Answer any 10 out of 12 questions)**	**5x10=50 marks** **(Answer any 5 out of 8 questions)**	**116**

Scheme for Practical Examination:

Sl.No.	Practical	Marks
1	Answer any **FIVE** out of **EIGHT** questions.(07 marks each) **(5 x 7)**	**35**
2	Practical record	**5**
3	Continuous Internal Assessment (CIA)	**10**
Total		**50**