RANI CHANNAMMA UNIVERSITY, BELAGAVI

PROGRAM /COURSE STRUCTURE AND SYLLABUS
as per the Choice Based Credit System (CBCS) designed in accordance with Learning Outcomes-Based Curriculum Framework (LOCF) of National Education Policy (NEP) 2020
for

B.Sc. Statistics

w.e.f.

Academic Year 2021-22 and onwards

Curriculum for B.Sc. Statistics of RCUB as per NEP 2020 w.e.f. 2021-22

RANI CHANNAMMA UNIVERSITY, BELAGAVI

BOS COMMITTEE (NEP- STATISTICS)
B.A./B.Sc. STATISTICS PROGRAM 2021-22

1	**Prof. V. S. Shigehalli** **Department of Mathematics, RCU Belagavi**	Chairman
2	**Prof. S. M. Hanchinal** Anjuman Arts, Science and Commerce College Vijaypur	Member
3	**Prof. P. S. Chanagond** S.S. Mamadapur Science College Badami	Member
4	**Prof. S. M. Hiremath** KRCES GGD and BMP Commerce and SVS Science College Baihongal	Member
5	**Dr. Prakash R. Kengnal** STC Arts and Commerce College, Banhatti	Member

Curriculum for B.Sc. Statistics of RCUB as per NEP 2020 w.e.f. 2021-22

Preamble

Several reforms in our education system has been proposed and developed by Ministry of HRD as National Education Policy (NEP)2020 which includes broad based multidisciplinary undergraduate education with necessary knowledge, skills and competencies. It also proposes to bring equity, efficiency and academic excellence at different levels of education. NEP also recommended multidisciplinary undergraduate programmes with multiple exit and multiple entry options with the provision of Certificate/Diploma/Degrees at each of the exits.

Probability and Statistics is the language of uncertainties, riddled modern information age. Statistics facilitates the decision-making process by quantifying the element of chance or uncertainties. Its descriptive and inferential procedures not only formulate the basis of the growth of almost all disciplines of the contemporary world, and also provide an array of employment avenues in all fields. This is a rigorous program in Probability Theory, Statistical Inference, Multivariate Analysis, Linear Models and Regression Analysis and Sample surveys and Design of Experiments designed to give a sound foundation in fundamentals and training in practical Statistics leading to statistical data analysis.

The eight semester 176 credit program has a variety of elective courses to choose from including enough courses on statistical software. A person successfully completing the program will have enough knowledge and expertise to statistically analyze small and large univariate and multivariate data sets, pursue advanced courses in Statistics or a Ph.D. in Statistics, work in software/data analytics industry as domain expert, independently consult for statistical data analysis. The program has proved to be one of the best in traditional Indian Universities/Institutes and has demand from students within and outside the State/Country.

Name of the Degree Program: B.Sc.

Discipline Core: Statistics **Total Credits for the Program: 176 (till 8ᵗʰ semesters)**

Year of Implementation: 2021-22

Program Outcomes:

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

8. Analyze, interpret the data and hence help policy makers to take a proper decision.

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

10. 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; ICT skills

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

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

12. 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.

RANI CHANNAMMA UNIVERSITY

VIdyaSangam, NH-4, Belagavi – 591156

Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Statistics Major & One MinorDiscipline Scheme for the Four Years Statistics B.Sc. Undergraduate Honors Programme with effect from 2021-22

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credits	Duration of exams(Hrs)
SEMESTER-I										
			IA	SEE	Total	L	T	P		
L1	21BSC1L1LK1	Kannada	30	70	100	4	-	-	3	2
	21BSC1L1LFK1	Functional Kannada								
L2	21BSC1L2LEN2	English	30	70	100	4	-	-	3	2
	21BSC1L2LHI2	Hindi								
	21BSC1L2LSN2	Sanskrit								
	21BSC1L2LTE2	Telugu								
	21BSC1L2LUR2	Urdu								
DSC1	21BSC1C1STS1L	**Descriptive Statistics**	30	70	100	4	-	-	4	2
	21BSC1C1 STS 1P	**Practical**	15	35	50	-	-	4	2	3
DSC1	Another Department Code	Another Department Course Title	30	70	100	4	-	-	4	2
			15	35	50	-	-	4	2	3
SEC1	21BSC1SE1CS1	Digital Fluency	15	35	50	1	-	2	2	2
VBC1	21BSC1V1PE1	Physical Education- Yoga	15	35	50	-	-	2	1	-
VBC2	21BSC1V2HW1	Health & Wellness	15	35	50	-	-	2	1	-
OEC1	21BSC1O1STS1	Statistical Methods	30	70	100	3	-	-	3	2
		Total Marks		**750**		**Semester Credits**				**25**

Curriculum for B.Sc. Statistics of RCUB as per NEP 2020 w.e.f. 2021-22

SEMESTER – II

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Durationof exams (Hrs)
			IA	SEE	Total	L	T	P		
L3	21BSC2L3LK2	Kannada	40	60	100	4	-	-	3	2
	21BSC2L3FKL2	Functional Kannada								
L4	21BSC2L4EN2	English	40	60	100	4	-	-	3	2
	21BSC2L4HI2	Hindi								
	21BSC2L4SN2	Sanskrit								
	21BSC2L4TE2	Telugu								
	21BSC2L4UR2	Urdu								
DSC2	21BSC2C2STS2L	**Probability and Distributions**	40	60	100	4	-	-	4	2
	21BSC2C2STS2P	**Practical**	25	25	50	-	-	4	2	3
DSC2	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	2
			25	25	50	-	-	4	2	3
AECC1	21BSC2AE1ES2	Environmental Studies	25	25	50	1	-	2	2	2
VBC3	21BSC2V3PE2	Physical Education-Yoga	25	-	25	-	-	2	1	-
VBC4	21BSC2V4NC1	Health & Wellness	25	-	25	-	-	2	1	-
OEC2	21BSC2O2STS2	Business Statistics	40	60	100	3	-	-	3	2
		Total Marks	**700**			**Semester Credits**			**25**	
Exit option with Certificate (with the completion of courses equal to a minimum of 48 credits)			**1400**						**50**	

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L5	21BSC3L5LK3	Kannada	40	60	100	4	-	-	3	2
	21BSC3L5LFK3	Functional Kannada								
L6	21BSC3L6EN3	English	40	60	100	4	-	-	3	2
	21BSC3L6HI3	Hindi								
	21BSC3L6SN3	Sanskrit								
	21BSC3L6TE3	Telugu								
	21BSC3L6UR3	Urdu								
DSC3	21BSC3C3STS1L	**Calculus and Probability Distributions**	40	60	100	4	-	-	4	2
	21BSC3C3STS1P	**Practical**	25	25	50	-	-	4	2	3
DSC3	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	2
			25	25	50	-	-	4	2	3
SEC2	21BSC3SE2ES2	Artificial Intelligence	25	25	50	1	-	2	2	2
VBC5	21BSC3V5PE3	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC6	21BSC3V6NC2	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
OEC3	21BSC3O3STS3	Applied statistics	40	60	100	3	-	-	3	2
		SECOND YEAR: SEMESTER-III Total Marks	**700**			**Semester Credits**			**25**	

SECOND YEAR: SEMESTER-III

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L7	21BSC4L7LK4	Kannada	40	60	100	4	-	-	3	2
	21BSC4L7LFK4	Functional Kannada								
L8	21BSC4L8EN4	English	40	60	100	4	-	-	3	2
	21BSC4L8HI4	Hindi								
	21BSC4L8SN4	Sanskrit								
	21BSC4L8TE4	Telugu								
	21BSC4L8UR4	Urdu								
DSC4	21BSC4C2STS2L	**Statistical Inference-I**	40	60	100	4	-	-	4	2
	21BSC4C2STS2P	**Practical**	25	25	50	-	-	4	2	3
DSC4	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	2
			25	25	50	-	-	4	2	3
AECC2	21BSC4AE1ES2	Constitution of India	25	25	50	1	-	2	2	2
VBC7	21BSC4V5PE4	Physical Education- Sports	25		25	-	-	2	1	-
VBC8	21BSC4V6NC3	NCC/NSS/R&R(S&G) / Cultural	25		25	-	-	2	1	-
OEC4	21BSC4O3STS4	Biostatistics	30	70	100	3	-	-	3	2
Total Marks			700			Semester Credits			25	
Exit option with Diploma in Science (with the completion of courses equal to a minimum of 96 credits)OR continue studies with Major and Minor			2800						100	

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
Third Year: SEMESTER-V										
Statistics as Major Discipline										
DSC5	21BSC5C5 STSMJ1L	**Matrix Algebra and RegressionAnalysis (3)**	40	60	100	3	-	-	3	2
	21BSC5C5STSMJ1P	**Practical**	25	25	50	-	-	4	2	3
DSC6	21BSC5C5STSMJ2L	**Analysis of variance and design ofexperiments(3)**	40	60	100	3	-	-	3	2
	21BSC5C5STSMJ2P	**Practical**	25	25	50	-	-	4	2	3
DSC5	Another Department Code as a Minor Subject	Another Department Course Title	40	60	100	3	-	-	3	2
			25	25	50	-	-	4	2	3
VC1	21BSC5VC1US	Unix & Shell Programming	40	60	100	3	-	-	3	2
	21BSC5VC1FD	Fundamentals of Data Science								
VBC9	21BSC5V5PE5	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC10	21BSC5V6NC4	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
SEC3	21BSC5SE3CS3	Cyber Security	25	25	50	1	-	2	2	2
			Total Marks		650	**Semester Credits**			22	

SEMESTER-VI

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
Statistics as Major Discipline										
DSC7	21BSC6C6STSMJ1L	**Statistical Inference-II**	40	60	100	3	-	-	3	2
	21BSC6C6STSMJ1P	**Practical**	25	25	50	-	-	4	2	3
DSC8	21BSC6C6STSMJ2L	**Sample Surveys and Statistics for National Development**	40	60	100	3	-	-	3	2
	21BSC6C6STSMJ2P	**Practical**	25	25	50	-	-	4	2	3
DSC6	Another Department Code as a Minor Subject	Another Department Course Title	40	60	100	3	-	-	3	2
			25	25	50	-	-	4	2	3
VC2	21BSC6VC2HT	Health Care Technologies	40	60	100	3	-	-	3	2
	21BSC6VC2DM	Digital Marketing								
INT1	21BSC6 INT1L	Internship	25	50	75	-	-	2	2	2
VBC1	21BSC6V5PE5	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC2	21BSC6V6NC4	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
SEC4	21BSC6SE4CS4	Professional Communication	25	25	50	1	-	2	2	2
		Total Marks	**725**			**Semester Credits**			**24**	
Exit with Bachelor of Science Degree, B. Sc. (with the completion of courses equal to a minimum of 140 credits)or continue studies with the Major			**4125**			**Total Credits for BSC Program**			**146**	

Statistics Subject as a Minor Discipline

SEMESTER-V										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	SEE	Total	L	T	P		
DSC5 As a Minor Subject	21BSC5C5STSMN1L	**Elements of Multivariate analysis and regression analysis**	40	60	100	3	-	-	3	2
	21BSC5C5STSMN1P	**Practical**	25	25	50	-	-	4	2	3

SEMESTER-VI										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	SEE	Total	L	T	P		
DSC6 As a Minor Subject	21BSC6C6STSMN1L	**Sample Surveys and Design and Analysis of Experiments**	40	60	100	3	-	-	3	2
	21BSC6C6STSMN1P	**Practical**	25	25	50	-	-	4	2	3

Concept Note, Abbreviation Explanation and Coding:

1. **CBCS** is a mode of learning in higher education which facilitates a student to have some freedom in selecting his/her ownchoices, across various disciplines for completing a UG/PG program.
2. A credit is a unit of study of a fixed duration. For the purpose of computation of workload as per UGC norms the following ismechanism be adopted in the University:
   One credit (01) = One
   Theory Lecture (L)
   period of one (1) hour.
   One credit (01) = One
   Tutorial (T) period of
   one (1) hour.
   One credit (01) = One practical (P) period of two (2) hours.
3. Course: paper/subject associated with AECC, DSC, DSEC, SEC, VBC, OEC, VC, IC and MIL
4. In case of **B.Sc**. **Once a candidate chose two courses/subjects of a particular two department in the beginning, he/she shall continue the same till the end of the degree, then there is no provision to change the course(s) and Department(s).**
5. A candidate shall choose **one of the Department's courses as major and other Department course as minor in fifth and sixth semester and major course will get continued in higher semester.**
6. Wherever there is a practical there will be no tutorial and vice-versa
7. A major subject is the subject that's the main focus of Core degree/concerned.
8. A minor is a secondary choice of subject that complements core major/ concerned.
9. Vocational course is a course that enables individual to acquire skills set that are required for a particular job.
10. Internship is a designated activity that carries some credits involving more than **25 days** of working in an organization (eitherin same organization or outside) under the guidance of an identified mentor. Internship shall be an integral part of the curriculum.
11. OEC: Students should opt OEC from departments other than major and minor disciplines

Curriculum for B.Sc. Statistics of RCUB as per NEP 2020 w.e.f. 2021-22

Abbreviation Explanations:

1. AECC: Ability Enhancement Compulsory Course.
2. DSC: Discipline Specific Core Course.
3. DSEC: Discipline Specific Elective Course.
4. SEC: Skill Enhancement Course.
5. VBC: Value Based Course.
6. OEC: Open/Generic Elective Course
7. VC: Vocational Course.
8. IC: Internship Course
9. L1:   Language One
10. L2:   MIL
11. L= Lecture; T= Tutorial; P=Practical.
12. MIL= Modern Indian Language; English or Hindi or Telugu or Sanskrit or Urdu

Program Coding:

1. Code 21: Year of Implementation
2. Code BSC: BSC Program under the faculty of Applied Science of the University
3. Code 1: First Semester of the Program, (2 to 6 represent higher semesters)
4. Code AE: AECC, (C for DSC, S for SEC, V for VBC and O for OEC)
5. Code 1: First "AECC" Course in semester, similarly in remaining semester for such other courses
6. Code LK: Language Kannada, similarly Language English, Language Hindi, Language Telugu, Language Sanskrit,&Language Urdu
7. Code 1: Course in that semester.
8. STS: Statistics

ASSESSMENT METHODS

Evaluation Scheme for Internal Assessment:

Theory:

Assessment Criteria	40 marks
1st Internal Assessment Test for 30 marks 1 hr after 8 weeks and 2nd Internal Assessment Test for 30 marks 1 hr after 15 weeks . Average of two tests should be considered.	30
Assignment	10
Total	**40**

Assessment Criteria	25 marks
1st Internal Assessment Test for 20 marks 1 hr after 8 weeks and 2nd Internal Assessment Test for 20 marks 1 hr after 15 weeks . Averageof two tests should be considered.	20
Assignment	05
Total	**25**

Practical:

Assessment Criteria	25 marks
Semester End Internal Assessment Test for 20 marks 2 hrs	20
Journal (Practical Record)	05
Total	**25**

Question Paper Pattern:

RANI CHANNAMMA UNIVERSITY
Department of Statistics

I Semester B.Sc Statistics

Sub: **Code:**   **Maximum Marks: 60**

a.   Answer any Six Questions from Question 1   b. Answer

any Three each Questions from Question 2,3,4and 5

Q.No.1.	Answer any Six Questions (At least Two question from EachUnit) a. b. c. d, e. f. g. h.	2X6=12
Q.No.2.	(Should cover Entire Unit-I) a. b. c. d.	4X3=15
Q.No.3.	(Should cover Entire Unit-II) a. b. c. d.	4X3=15
Q.No.4.	(Should cover Entire Unit-III) a.	4X3=15

	b. c. d.	
Q.No.5.	**(Should cover Entire Unit-IV)** **a.** **b.** **c.** **d.**	**4X3=15**

COURSE-WISE SYLLABUS

Semester - I

Course Title: Descriptive Statistics	
Total Contact Hours: 56	Course Credits:04
Formative Assessment Marks: 40	Duration of ESA/Exam: 2 hours
	Summative Assessment Marks: 60

Title of the Course: Descriptive Statistics

Number of TheoryCredits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours/semester
4	56	2	52

Content of Theory Course 1	56 Hrs
Unit – 1 : Introduction to Statistics	**14 Hrs**
Statistics: Definition and scope. Concepts of statistical population and sample (SRS, Stratified, Systematic and Cluster sampling methods Definitions only). 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. (Ref. 4)	
Unit – 2: Univariate Data Analysis	**14 Hrs**
Measures of Central Tendency: Mean, weighted mean, Median, Mode, Geometric and harmonic means, properties, merits and limitations, relation between these measures. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation and their relative measures. Gini's Coefficient, Lorenz Curve. Moments, Skewness and Kurtosis. Quantiles and measures based on them. Box Plot. Outliers. normal data sets. (Ref.10).	
Unit – 3: Bivariate Data Analysis	**14 Hrs**
Bivariate Data, Scatter plot, Correlation, Karl Pearson's correlation coefficient, Rank correlation – Spearman's and Kendall's measures. Concept of errors, Principle of least squares, fitting of polynomial and exponential curves. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination. (Ref. 10)	
Unit –4: Multivariate Data Analysis	**14 Hrs**
Analysis of Categorical Data: Contingency table, independence and association of attributes, measures of association - odds ratio, Pearson's and Yule's measure, Multivariate Frequencies, Multivariate Data Visualization, mean vector and dispersion matrix, Multiple linear regression, multiple and partial correlation coefficients. Residual error variance. (Ref. 7)	

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. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton &Company.
4. Gupta, S.C. (2018), Fundamental of Statistics, Himalaya Publishing House, 7th Edition.
5. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, SultanChand and Co. 12th Edition.
6. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to MathematicalStatistics, Pearson 7th Edition.
7. Joao Mendes Moreira, Andre C P L F de Carvalho, Tomas Horvath (2018), GeneralIntroduction to Data Analytics, Wiley.
8. Johnson, R.A. and Bhattacharyya, G.K. (2006), Statistics: Principles and methods. 5thEdition, John Wiley & Sons, New York.
9. Medhi, J. (2005), Statistical Methods, New Age International.
10. Ross, S.M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.
11. Tukey, J.W. (1977), Exploratory Data Analysis, Addison-Wesley Publishing Co.

Year	I	Course Code: 21BSC1C1STS1P	Credits	02
Sem.	I		Hours	45
		Course Title: Practical Course - I		
Course Pre-requisites, if any:		Knowledge of Excel		
Formative Assessment Marks: 25		Summative Assessment Marks: 25	Duration of ESA: 03 hrs.	

Content of Practical Course - I

(Computing all the practicals manually and using Excel)

1. Presentation of data by frequency tables, diagrams and graphs, stem and leaf, partitionvalues.

2. Arithmetic Mean (AM), geometric mean, harmonic mean, weighted AM, corrected mean.

3. Mode, median, partition values.

4. Absolute and relative measures of dispersion, Box plots.

5. Problems on moments, skewness and kurtosis.

6. Fitting of curves by least squares method.

7. Product moment correlation coefficient and rank correlation.

8. Regression of two variables.

9. Multivariate Descriptive statistics, mean Vector, dispersion matrix correlation matrix,Partial and Multiple correlation.

10. Problems on Association of attributes.

1. Statistical Methods (Open Elective)

Year	I	Course Code: 21BSC1O1STS1		Credits	03
Sem.	1	Course Title: Statistical Methods		Hours	40
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 40		Summative Assessment Marks: 60		Duration of ESA:.02 hrs.	

Course Objectives

1. This is an open elective course for other than statistics students.
2. The students will learn the elements of descriptive statistics, probability, statistical methods such as tests of hypotheses, correlation and regression.

Course Outcomes

Students will be able to;

CO1. Acquire knowledge of statistical methods.

CO2. Identify types of data and visualization, analysis and interpretation.

CO3. Know about elementary probability and probability models.

CO4. Employ suitable test procedures for given data set.

Contents

Unit 1: Introduction   **10 Hours**

Definition and scope of Statistics. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram and ogives. Concepts of statistical population and sample. Sampling from finite population - Simple random sampling, Stratified and systematic random sampling procedures (definitions and methods only). Concepts of sampling and non-sampling errors.

Unit 2: Univariate and Bivariate Data Analysis   **10 Hours**

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.

Bivariate data, scatter diagram, Correlation, Karl-Pearson's correlation coefficient, Rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

Unit 3: Probability and Distributions   10 Hours

Probability: Random experiment, trial, sample space, events-mutually exclusive and exhaustive events. Classical, statistical and axiomatic definitions of probability, addition and multiplication theorems, Bayes theorem (only statements). Discrete and continuous random variables, probability mass and density functions, distribution functions, expectation of a random variable.

Standard univariate distributions: Binomial, Poisson and Normal distributions (Elementary properties and applications only).

Unit 4: Sampling Distributions and Testing of Hypothesis   10 Hours

Distribution of sample mean from a normal population, Chi-square, t and F distributions (No derivations) and their applications.

Statistical Hypothesis – null and alternative hypothesis, simple and composite hypothesis. Type I and Type II errors, level of significance, critical region, P-value and its interpretation. Test for single mean, equality of two means, single variance, and equality of two variances for normal populations.

References

1. Daniel, W. W. (2007 Biostatistics - A Foundation for Analysis in the Health Sciences, Wiley

2. T.W. Anderson and Jeremy D. Finn(1996). The New Statistical Analysis of Data, Springer.

3. Mukhyopadyaya P(1999). Applied Statistics, New Central book Agency, Calcutta.

4. Ross, S.M.(2014) Introduction to Probability and Statistics For Engineers and Scientists.

5. Cochran, W G (1984): Sampling Techniques, Wiley Eastern, New Delhi.

B.Sc.
Semester-II

Course Title: Probability and Distributions	
Total Contact Hours: 56	Course Credits:04
Formative Assessment Marks: 40	Duration of ESA/Exam: 2hours
	Summative Assessment Marks: 60

Course Pre-requisite(s): II PUC with Mathematics

Title of the Course: Probability and Distributions

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours/semester
4	56	2	52

Content of Theory Course 2	56Hrs
Unit –1 : Probability	14 Hrs
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, Totalprobability rule, Bayes theorem- applications.	
Unit –2: Random Variables And Mathematical Expectation-(One Dimension)	14 Hrs
Definitions of discrete and continuous random variables, Distribution function, probability mass and density functions – properties and illustrations, Expectation of a random variable and rules of expectation and related results, Moments and moment generating function – properties and uses.	
Unit –3 : Standard Distributions	14 Hrs
Bernoulli, Binomial, Poisson, distributions– mean, variance, moments and m. g. f. recursive relations for probabilities and moments of Binomial and Poisson distributions, Normal distribution and its properties.	

Unit –4: Data Analysis Using R	14 Hrs
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.	

References

1. Dudewitz. 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, SultanChand and Co, 12th 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 ofStatistics, 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. Rfor beginners by Emmanuel Paradis (freely available at **https://cran.r-project.org/doc/contrib/Paradisrdebuts_en.pdf**)

Year	I	**Course Code:** 21BSC1C1STS2P	**Credits**	02
Sem.	II	**Course Title:** Practical Course - II	**Hours**	45
Course Pre-requisites, if any:		Knowledge of Excel and R		
Formative Assessment Marks: 25		Summative Assessment Marks: 25	Duration of ESA: 03 hrs.	

Content of Practical Course 2: List of Experiments to be conducted

(Computing all the practicals manually and using Excel/R)

1. Two exercise on Descriptive statistics (Presentations, Summarizations, correlations,regression and Graphs using R)
2. Computing probability: using addition and multiplication theorems.
3. Conditional probability and Bayes' theorem.
4. Problems on pmf, expectation, variance, quantiles, skewness, kurtosis (Discrete Case).
5. Problems on pdf, expectation, variance, quantiles, skewness, kurtosis (Continuouscase).
6. Problems on discrete probability distributions(Binomial and Poisson)
7. Problems on Normal probability distributions
8. Computation of moments and Moment generating functions (Discrete and ContinuousCase).
9. Fitting of distributions Binomial, Poisson, Normal distributions.
10. Generation of random samples. (Binomial, Poisson, Normal)

Year	I	Course Code: 21BSC1O1STS2		Credits	03
Sem.	II	**Course Title: Business Statistics**		**Hours**	40
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 40		Summative Assessment Marks: 60		Duration of ESA:.02 hrs.	

2. Business Statistics (Open Elective)

Course Objectives

1. Provide an introduction to basics of statistics within a financial context.

2. To enable students to use statistical techniques for analysis and interpretation of business data.

Course Outcomes (CO)

Upon the completion of this course students should be able to:

CO1.Frame and formulate management decision problems.

CO2. Understand the basic concepts underlying quantitative analysis.

CO3. Use sound judgment in the applications of quantitative methods to management decisions.

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.

2. Students are encouraged to use resources available on open sources.

Contents

Unit 1: Statistical Data and Descriptive Statistics   10 Hours

Nature and Classification of data: univariate, bivariate and multivariate data; time-series and cross- sectional data. Measures of Central Tendency: mathematical averages including arithmetic mean geometric mean and harmonic mean, properties and applications. Positional Averages Mode and Median (and other partition values including quartiles, deciles, and percentiles). Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/variance Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures; Concept of Kurtosis.

Unit 2: Simple Correlation and Regression Analysis   10 Hours

Correlation Analysis: Meaning of Correlation: simple, multiple and partial; linear and non-linear, Correlation and Causation, Scatter diagram, Pearson's co-efficient of correlation; calculation and properties (Proof not required). Correlation and Probable error; Rank Correlation.

Regression Analysis: Principle of least squares and regression lines, Regression equations and estimation; Properties of regression coefficients; Relationship between Correlation and Regression coefficients; Standard Error of Estimate and its use in interpreting the results.

Unit 3: Index Numbers   *10 Hours*

Definition, Problems involved in the construction of index numbers, methods of constructing index numbers of prices and quantities, simple aggregate and price relatives method, weighted aggregate and weighted average of relatives method, important types of weighted index numbers: Laspeyre's, Paasche's, Bowley's, Marshall-Edgeworth, Fisher's, method of obtaining price and quantity index numbers, tests consistency of index numbers, time reversal test and factor reversal test for index numbers, Uses and limitations of index numbers. Consumer price index number:

Problems involved in the construction of cost of living index number, advantages and disadvantages, Aggregative expenditure method and Family budget method for the construction of consumer price index numbers. Applications of Cost of Living Index numbers. Definition and measurement of Inflation rate – CPI and GNP Deflator.

Unit 4: Time Series Analysis   10 Hours

Introduction, definition and components of Time series, illustrations, Additive, Multiplicative and mixed models, analysis of time series, methods of studying time series: Secular trend, method of moving averages, least squares method – linear, quadratic, exponential trend fittings to the data. Seasonal variation - definition, illustrations, measurements, simple average method, ratio to moving average method, ratio of trend method, link relatives method, Cyclical variation- definition, distinction from seasonal variation, Irregular variation- definition, illustrations.

References

1. Levin, Richard, David S. Rubin, Sanjay Rastogi, and H M Siddiqui. Statistics for Management. 7th ed., Pearson Education.

2. David M. Levine, Mark L. Berenson, Timothy C. Krehbiel, P. K.Viswanathan, Business Statistics: A First Course, Pearson Education.

3. Siegel Andrew F. Practical Business Statistics. McGraw Hill Education.

4. Gupta, S.P., and Archana Agarwal. Business Statistics, Sultan Chand and Sons, New Delhi.

5. Vohra N. D., Business Statistics, McGraw Hill Education.

6. Murray R Spiegel, Larry J. Stephens, Narinder Kumar. Statistics (Schaum's Outline Series), Mc-Graw Hill Education.

7. Gupta, S.C. Fundamentals of Statistics. Himalaya Publishing House.

8. Anderson, Sweeney, and Williams, Statistics for Students of Economics and Business, Cengage Learning.