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.