Course Title	Quantitative Methods in Educational Research
Course Code	SCE102.2
Credits	2
Duration	September to December 2022
Time & Location	Offline classes at HBCSE. 2 hr every week
Contact Hours	28 hrs, 14 sessions, 14 weeks some of the sessions will be in computer lab with live practice of R
Instructors:	Aniket Sule
TA	Pritesh Ranadive
Learning Objectives	1. To understand experiment design process including sampling methods and reliability 2. To understand and calculate descriptive statistics parameters of data 3. To learn to apply inferential statistical tests on the data and draw inferences from the test results 4. To get familiar with R statistical software and spreadsheet based statistical analysis

Course Plan

Session No.	Topic
1	Introduction to the Practice of Statistics, Observational Studies, Experiments, and Simple Random Sampling, Other Effective Sampling Methods, Sources of Errors in Sampling, The Design of Experiments, The sampling strategy to be used, Probability samples Non-probability samples.
2	Validity and reliability: Defining validity, Triangulation, Ensuring validity, Reliability in quantitative research, Reliability in qualitative research, Validity and reliability in interview, Validity and reliability in experiments, Validity and reliability in questionnaires, Validity and reliability in Observations, Validity and reliability in tests, Validity and reliability in life.
3	Organizing Qualitative Data, Organizing Quantitative Data, Graphical Misrepresentations of Data, Numerically Summarizing Data Outline, Measures of Central Tendency, Measures of Dispersion, Measures of Central Tendency and Dispersion from Grouped Data, Measures of Position, The Five-Number Summary and Boxplots.
4	Surveys, longitudinal, cross-sectional and trend studies: Introduction, Some preliminary considerations, Planning a survey, Survey sampling, Longitudinal, cross-sectional and trend studies, Strengths and weaknesses of longitudinal, cohort and cross-sectional studies, Postal, interview and telephone surveys.
5	Describing the Relation between Two Variables, Scatter Diagrams and Correlation, Least-Squares Regression, The Coefficient of Determination Discrete Probability Distributions, Discrete Random Variables, The Binomial Probability Distribution.
6	Programming with R – I
7	The Normal Probability Distribution, Properties of the Normal Distribution, The Standard Normal Distribution, Applications of the Normal Distribution, Assessing Normality, The Normal Approximation to the Binomial Probability Distribution, Sampling Distributions: Distribution of the Sample Mean, Distribution of the Sample Proportion
8	Ex post facto research Introduction:Co-relational and criterion groups, designs, Characteristics of ex post facto research Occasions when appropriate, Advantages and disadvantages of ex post facto research, Designing an ex post facto investigation, Procedures in ex post facto research, Experiments, quasi-experiments, single-case research and meta-analysis: Introduction Designs in educational experimentation, True experimental designs, A quasi-experimental design: the non-equivalent control group design, Single-case research: ABAB design, Procedures in conducting experimental Research, Examples from educational research, Evidence-based educational research and meta-analysis.
9	Estimating the Value of a Parameter Using Confidence Intervals: The Logic in Constructing Confidence Intervals about a Population Mean where the Population Standard Deviation Is Known, Confidence Intervals about a Population Mean in Practice where the Population Standard Deviation Is Unknown, Confidence Intervals about a Population Proportion.

10	Programming with R – II
11	Hypothesis Tests : The Language of Hypothesis Testing, Hypothesis Tests for a Population, Mean Assuming the Population Standard Deviation Is Known, Hypothesis Tests for a Population Mean in Practice, Hypothesis Tests for a Population Proportion
12	Inferences on Two Samples: Inference about Two Means: Dependent Samples, Inference about Two Means: Independent Samples, Inference about Two Population Proportions
13	Additional Inferential Procedures: Goodness-of-Fit Test, Tests for Independence and the Homogeneity of Proportions, Testing the Significance of the Least-Squares, Regression Model, Confidence and Prediction Intervals, ANOVA
14	Programming with R – III