

St. Xavier's College(Autonomous),Kolkata
Syllabus for “R Programming Language and Application to Data Analytics”
Duration of Course : 6 weeks(36 hrs),
Week End Classes, Sat=5-8PM, Sun=4-7PM
Eligibility: Minimum 10+2 qualification with knowledge in at least one
programming language such C/C++/Java/Python

1. Introduction to R : (3hrs)

Introduction to Algorithm and programming concepts.

What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), packageDescription(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.

2. R Data Types: (3+3=6 hrs)

R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement. Solving problems from Assignment sheet.

3. Functions in R-Language: (3+3=6 hrs)

R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().

4. String Manipulation in R language:

String fnctions : grep(), nchar() , paste(), sprintf(), substr(), strsplit(), regex() gregexpr(), toupper(), tolower(), paste() (2 hrs)

5. Bit-wise operators using R: (4 hrs)

bitwOr(value1,value2), bitwXor(value1,value2), bitwNot(value),
bitwAnd(value1,value2),bitwShiftL(value,shift), bitwShiftR(value,shift),
Solving problems from assignment sheet.

6. Creating Data Frames and visualization of Data: (6 hrs)

Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() File Handling in R language, -CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

7. Installing RMySQL Package in R: (3 hrs)

Installing RMySQL Package, Creating Database, table under MYSQL, Inserting data in a table , Update and alter table, Display content of table.

8. Descriptive Statistics using R: (6 hrs)

Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors. Line Chart, Scatterplot, Developing graphs, Box Plot, Drawing line, circle, rectangle, triangle using R language .

REFERENCES:

1. “The Book of R” by Tilman M. Davies, no starch press(San Francisco)
2. “The Art of R programming” by Norman Matloff, no starch press(San Francisco)