# 19CS32E2 - R PROGRAMMING

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| **Course Category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture – Tutorial – Practical:** | 3-0-0 |
| **Prerequisite:** | Require fundamental knowledge in any programming language, mathematics and statistical techniques | **Sessional Evaluation:****Univ. Exam Evaluation:****Total Marks:** | 4060100 |
| **Course Objectives** | * Gain a foundational understanding of R Programming basics
* Master the R programming and understand how various constructs are implemented in complex problems and applications
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| **Course Outcomes** | Upon the successful completion of the course, the students will be able to: |
| CO1 | Understand the fundamental building blocks of R programming |
| CO2 | Learn some of the commands and packages to develop simple programs |
| CO3 | Acquire knowledge of Various storage and retrieval techniques and applicability |
| CO4 | Study various types of viewing and forms of data objects for application development |
| CO5 | Adapt different types of testing methodologies and supporting comparative study  |
| CO6 | Get the clear view of how to analyze methods using graphical representations based on statistical data |
| **Course Content** | **UNIT – I****Introduction to R programming:** History of R programming, Reserved words of R, Variables and constants of R, Operators of R, precedence and association of R, data types in R. Decision making statements in R programming. Iterative statements ,functions ,strings, arrays, vectors, lists, matrices, factors ,data frames, data reshaping and data interfacing.**UNIT – II****R-command packages:** Standard Command Packages, Getting Extra Packages of R Commands-Installing Extra Packages for Windows, Running and Manipulating Packages , Loading Packages, Windows-Specific Package Commands.**UNIT – III****Simple Math:** Use R Like a Calculator, Storing the Results of Calculations.**Reading and Getting Data into R:** Using the combine Command for Making Data, Entering Numerical and Text Items as Data, Scan Command for Making Data.**Reading Bigger Data Files:** read.csv () Command, Other Commands for Reading Data in R, Missing Values in Data Files.**UNIT – IV****Viewing Named Objects**: Viewing Previously Loaded Named-Objects-Viewing All Objects, Viewing Only Matching Names and Removing Objects from R.**Manipulating Objects:** Manipulating Vectors, Manipulating Matrix and Data Frames, Manipulating Lists.**Constructing Data Objects:** Making Lists, Making Data Frames, Making Matrix Objects.**Forms of Data Objects:** Testing and Converting , Testing to See What Type of Object You Have , Converting from One Object Form to Another , Convert a Matrix to a Data Frame, Convert a Data Frame into a Matrix, Convert a Data Frame into a List and Convert a Matrix into a list.**UNIT – V****Simple Hypothesis Testing:** Using the Student’s t-test, Two-Sample t-Test with Unequal Variance, Two-Sample t-Test with Equal Variance, One-Sample t-Testing, Using Directional Hypothesis Formula, Syntax and Sub setting Samples in the T-Test.**The Wilcoxon U-Test (Mann-Whitney):** Two-Sample U-Test, One-Sample U-Test, Using Directional Hypotheses, and Formula Syntax and Sub setting Samples in the U-test.**Paired t- and U-Tests :** Correlation and Covariance , Simple Correlation, Covariance, Significance Testing in Correlation Tests and Formula Syntax**UNIT – VI****Introduction to Graphical Analysis:****Box-whisker Plots :**Basic Box plots, Customizing Box plots, Horizontal Box plots,**Scatter Plots:** 2 Basic Scatter Plots, Adding Axis Labels, www. Plotting Symbols, Setting Axis Limits, Using Formula Syntax, Adding Lines of Best-Fit to Scatter Plots.**Pairs Plots:** (Multiple Correlation Plots) Line Charts , Line Charts Using Numeric Data , Line Charts Using Categorical Data, Pie Charts , Cleveland Dot Charts . Bar Charts: Single-Category Bar Charts and Multiple Category Bar Charts. |
| **Text Books and References** | **TEXT BOOK(S):**1. Beginning R, the statistical programming language by Dr Mark Gardener.

**REFERENCE BOOKS:**1. “R Programming for Beginners: Fast and Easy Learning” by [Steven Keller](https://www.amazon.in/Steven-Keller/e/B00JC9QD42/ref%3Ddp_byline_cont_ebooks_1),**Kindle Edition**.
2. “A Handbook of Statistical Analyses Using R” by Brian Everitt and Torsten Hothorn.
3. “R Graphics Cookbook” by Winston Chang.
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| **E-Resources** | 1. <https://nptel.ac.in/courses>
2. <https://freevideolectures.com/university/iitm>
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