

**M.M.INSTITUTE OF COMPUTER TECHNOLOGY & BUSINESS MANAGEMENT**  
**MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSITY)**  
**MULLANA-AMBALA, HARYANA (INDIA)-133207**  
(Established under Section 3 of the UGC Act, 1956)  
(Accredited by NAAC with Grade 'A++')

Session: 2025-26  
 Paper Code: BCA-602

Class/Semester/Section: BCA 6<sup>th</sup> Sem  
 Paper: R Programming Lab

**Course Objective:** • To understand basics of R programming, syntax and semantics.

- To understand the control structure in R.
- Covers practical issues in statistical computing and analysis which includes programming in R, reading and writing data into R and handling missing data.
- Writing R functions, debugging, organizing and commenting R code as well the concept of object-oriented programming.
- To create and customize various graphs in R.

**Course Outcome:**

- CO1 Learn basics of R Programming with Vector, List, Matrices, Data Frame, etc.
- CO2 Design and interpret programs involving decision structures, loops, functions, arrays and strings.
- CO3 Design and Apply programs in various applications.
- CO4 Analysis on datasets with various graphical functions in R.
- CO5 Able to apply R programming from a statistical perspective and use of various visualization tools.

**Listing of Practical Experiments**

Section	Sr. No.	Experiment	CO	PO
A	1.	<b>Installation and Setup of R/RStudio</b> – Install R/RStudio, explore RStudio interface, run basic commands. Write a program to display “Welcome to R Programming”.	CO1	PO2
	2.	Write an R script to calculate the sum, difference, product, and division of two numbers.	CO1	PO2
	3.	<b>Variables and Operators in R</b> – Perform arithmetic, relational, and logical operations using variables. <b>Experiment:</b> Create variables of different data types in R and display their type using appropriate functions	CO1	PO2
	4.	<b>Vectors and Vectorized Operations</b> – Create vectors and apply vectorized arithmetic operations. <b>Experiment:</b> 1. Write a R program to perform following operations on Vector: min(), max(), mean(), sqrt(), length(), sum(), prod(), sort()(in ascending and descending order), rev(), addition/subtraction/multiplication/division of two vectors. 2. Write a R program to create a list containing a vector, a matrix and a list and perform following operations: i. Update the elements in the list. ii. Merge two lists into one list. iii. Count number of objects in a given list.	CO1	PO2
	5.	<b>Subsetting Data in R</b> – Subset vectors using indexing, logical conditions, and named elements. <b>Experiment:</b> Create a vector of 10 elements and extract even-	CO1	PO2

		indexed elements.		
	6.	<b>Handling NA and NULL Values</b> – Detect, remove, and replace NA and NULL values; apply coding standards. <b>Experiment:</b> Create a vector with NA values and write a program to remove them.	CO1	PO2
B	7.	<b>Conditional Statements Using if-else and Nested if-else Statements</b> – Implement decision-making using if statements. <b>Experiment:</b> Write a program to check leap year in R.	CO2	PO2
	8.	<b>For Loop Implementation and While Loop Implementation</b> – Use for loop for repetitive tasks and sequence generation.  <b>Experiment:</b> 1. Write a user defined function to generate Fibonacci series using while loop. 2. Generate the multiplication table of a given number using a for loop. 3. Write a program in R to make a simple calculator	CO2	PO2
	9.	<b>Scoping Rules in R</b> – Demonstrate local and global variables using functions. <b>Experiment:</b> Write an R program to demonstrate the difference between local and global variables by defining a variable outside a function and modifying it inside the function. Display the values of the variable before and after function execution.	CO2	PO2
	10.	<b>Apply Family Functions</b> – Use apply(), lapply(), sapply(), and tapply(). <b>Experiment:</b> Use apply(), lapply(), and sapply() on a matrix and compare the results.	CO2	PO2
	11.	<b>Working with Date, Time, and Sleep Functions</b> – Handle system time, dates, and implement delays using Sys.sleep(). <b>Experiment:</b> Write a program to display the current system date and time and pause execution for 5 seconds.	CO2	PO2
	12.	<b>Reading and Writing Data Files</b> – Read/write CSV and text files using read.csv() and write.csv(). <b>Experiment:</b> Read a CSV file into R and display summary statistics of the data.	CO3	PO3
C	13.	<b>Saving and Loading R Data Objects</b> – Use save(), load(), and RData files. <b>Experiment:</b> Create an R object, save it to a file, and reload it.	CO3	PO3
	14.	<b>Generating Data in R</b> – Generate sequences and random data using built-in functions. <b>Experiment:</b> Generate 100 random numbers between 1 and 50 and store them in a vector.	CO3	PO3
	15.	<b>Regular and Random Sequences</b> – Use seq(), rep(), runif(), rnorm(). <b>Experiment:</b> Generate a regular sequence from 1 to 100 with a step size of 5.	CO2	PO3
	16.	<b>Handling Missing Data</b> – Use is.na(), na.omit(), and complete.cases(). <b>Experiment:</b> Write a program to identify and replace missing values with the mean.	CO3	PO3
	17.	<b>Creating and Manipulating Objects</b> – Work with vectors, matrices, lists, and data frames. <b>Experiment:</b> Write a R program to create a data frame and get the structure, statistical summary and nature of the data of a given data frame.	CO3	PO3

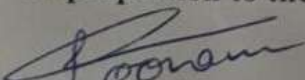


D	18.	<b>Indexing and Accessing Object Values</b> – Demonstrate indexing systems for different R objects. <b>Experiment:</b> Write a R program to create a matrix and perform following operations: i. Extract the sub matrix whose rows have column value > 3 from a given matrix. ii. Convert a matrix to a 1 dimensional array.	CO3	PO3
	19.	<b>Introduction to S3 and S4 Classes</b> – Create and use simple S3 and S4 objects. <b>Experiment:</b> Demonstrate indexing on vectors, matrices, and data frames.	CO3	PO3
	20	<b>Reference Classes and User-Defined Functions</b> – Implement reference classes and arithmetic functions. <b>Experiment:</b> Create a reference class to perform basic arithmetic operations.	CO3	PO3
	21.	<b>Creating Basic 2D and 3D Plots</b> – Plot line graphs, scatter plots, and bar charts. <b>Experiment:</b> Create a scatter plot for two numeric variables.	CO4	PO3
	22.	<b>Customizing Graphs in R</b> – Add titles, labels, legends, colors, and themes. <b>Experiment:</b> Customize the plot created in exp16 by adding title, axis labels, and legend.	CO4	PO3
	23.	<b>One-Way ANOVA Using R</b> – Perform and interpret one-way ANOVA. <b>Experiment:</b> Perform one-way ANOVA on a dataset and interpret the result.	CO5	PO3
	24.	<b>Linear Regression Analysis</b> – Implement linear regression, interpret model output, and visualize results. <b>Experiment:</b> Fit a linear regression model and plot the regression line.	CO5	PO3

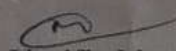
### Teaching and Examination Scheme

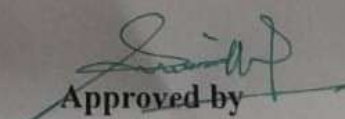
Teaching Hours	Credits	Examinational Marks			Internal Break-up					
		Internal	Practical	Total	Attendance	File	Viva-Voce 1	Viva-Voce2	Quiz 1	Quiz 2
02	1.0	60	40	100	10*	10	10	10	10	10

\*In proportion to the percentage of classes attended

  
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