

**UNIVERSITY OF MADRAS**  
**BACHELOR OF COMPUTER APPLICATIONS (BCA)**  
**DEGREE PROGRAMME**  
**SYLLABUS WITH EFFECT FROM 2023-2024**

**Year: III**

**Semester: VI**

<b>R-Programming</b> Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wDS	<b>320C6A</b>
<b>Credits 4</b>	<b>Lecture Hours:6 per week</b>
<p><b>Learning Objectives:</b> (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> <li>• To understand and able to use basic programming concepts</li> <li>• To automate data analysis, working collaboratively and openly on code</li> <li>• To know how to generate dynamic documents</li> </ul>	
<p><b>Course Outcomes:</b> (for students: To know what they are going to learn)</p> <p>CO1: To understand the problem solving approaches</p> <p>CO2: To learn the basic programming constructs in R Programming</p> <p>CO3: To learn the basic programming constructs in R Programming</p> <p>CO4: To use R Programming data structures - lists, tuples, dictionaries.</p> <p>CO5: To do input/output with files in R Programming.</p>	

<b>Units</b>	<b>Contents</b>
<b>I</b>	Introduction to R programming: What is R? - Installing R and R Studio – R Studio Overview - Working in the Console - Arithmetic Operators – LogicalOperations - Using Functions - Data structures, variables, and data types in R: Creating Variables - Numeric, Character and Logical Data - Vectors -Data Frames - Factors -Sorting Numeric, Character, and Factor Vectors -Special Values.
<b>II</b>	CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations
<b>III</b>	Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions Data Visualization using R: Scatter Plots - Box Plots - Scatter Plots and Box and-Whisker Plots Together -Customize plot axes, labels, add legends, and add colours
<b>IV</b>	Descriptive statistics in R: Measures of central tendency - Measures of variability - Skewness and kurtosis - Summary functions, describe functions,and descriptive statistics by group. Testing of Hypothesis using R: T-test, Paired Test, correlation, Chi Square test, Analysis of Variance and Correlation
<b>V</b>	Predictive Analytics: linear Regression model, Non-Linear Least Square, multiple regression analysis, Logistic Regression, Panel Regression Analysis,ARCH Model, GARCH models, VIF model

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**Learning Resources:**

**Recommended Texts**

1. Roger D. Peng, "R Programming for in", 2012
2. Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011

**Reference Books**

1. Garrett Golemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2. Venables , W.N., and Ripley, "S programming", Springer, 2000.