Short Syllabus

BCSE207L   **Programming for Data Science**   **(2-0-0-2)**

Functions in R - Loading Functions, Writing Functions; Vectors and Lists - Vectorized Operations, Accessing List Elements; Data Wrangling-The Data Generation Process, Data Frames, Working with Data Frames, Working with CSV Data; Manipulating Data with dplyr and tidyr-Data Manipulation, Core dplyr Functions, dplyr in Action, Analyzing Flight Data, Reshaping Data with tidyr; Accessing Databases and Web APIs - Data Visualization Designing Data Visualizations,The Purpose of Visualization, Selecting Visual Layouts;
Interactive Visualization in R - The Plotly Package, The Rbokeh Package, The Leaflet Package.

Course code	Course Title			L	T	P	C
BCSE207L	**Programming for Data Science**			**2**	**0**	**0**	**2**
Pre-requisite	**NIL**		Syllabus version				
			1.0				

Course Objectives

1. To provide necessary knowledge on data manipulation and to perform analysis on the practical problems using a programming approach.
2. To generate report and visualize the results in graphical form using programming tools.
3. To learn and implement R programs for data science.

Course Outcome

Upon completion of the course, the student will be able to

1. Engrave and use R language to solve problems.
2. Design a suitable form for analysis from real-time data.
3. Formulate insights from the data through statistical inferences.
4. Evaluate and visualize the results, analyze the performance of the models.

Module:1	Functions in R	2 hours

Programming with R- Running R Code - Including Comments - Defining Variables, Functions -Built-in R Functions - Loading Functions - Writing Functions - Using Conditional Statements.

Module:2	Vectors and Lists	3 hours

Vector - Vectorized Operations - Vector Indices - Vector Filtering - Modifying Vectors, Lists - Creating Lists - Accessing List Elements - Modifying Lists- Applying Functions to Lists with lapply().

Module:3	Data Wrangling	4 hours

Understanding Data - The Data Generation Process - Finding Data - Types of Data - Interpreting Data - Using Data to Answer Questions - Data Frames - Working with Data Frames -Working with CSV Data.

Module:4	Manipulating Data with dplyr and tidyr	5 hours

Data Manipulation - Core dplyr Functions- Performing Sequential Operations -Analyzing Data Frames by Group - Joining Data Frames Together - dplyr in Action: Analyzing Flight Data- Reshaping Data with tidyr -From Columns to Rows: gather() - From Rows to Columns: spread() - tidyr in Action: Exploring Educational Statistics.

Module:5	Accessing Databases and Web APIs	5 hours

An Overview of Relational Databases -A Taste of SQL-Accessing a Database from R - Accessing Web APIs -RESTful Requests -Accessing Web APIs from R -Processing JSON Data -APIs in Action: Finding Cuban Food in Seattle.

Module:6	Data Visualization	6 hours

Designing Data Visualizations - The Purpose of Visualization - Selecting Visual Layouts - Choosing Effective Graphical Encodings - Expressive Data Displays - Enhancing Aesthetics - Creating Visualizations with ggplot2- A Grammar of Graphics - Basic Plotting with ggplot2 - Complex Layouts and Customization - Building Maps- ggplot2 in Action: A case study.

Module:7	Interactive Visualization in R	3 hours

The Plotly Package - The Rbokeh Package - The Leaflet Package - Interactive Visualization in Action: Exploring Changes to the City of Seattle.

Module:8	Contemporary Issues	2 hours

	Total Lecture hours:	**30 hours**

Text Book(s)

1. Michael Freeman and Joel Ross, Programming Skills for Data Science: Start Writing

	Code to Wrangle, Analyze, and Visualize Data with R, Addison-Wesley, 2018.
Reference Books	
1.	Benjamin S. Baumer, Daniel T. Kaplan and Nicholas J. Horton, Modern Data Science with R, Chapman and Hall/CRC, 2021.
2.	John Mount and Nina Zumel, Practical Data Science with R, 2nd edition, Wiley, 2019.

Mode of Evaluation : Continuous Assessment Tests, Quizzes, Assignment, Final Assessment Test			
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