## Semester Lecture Plan

**Name of the college: Government College of Arts, Science and Commerce, Sanquelim - Goa**

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| **Name of Faculty:** Nilesh Natekar | **Subject:** Computer Science |

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| **Paper code: CSC324 – R Programming for Data Science** | **Program/Course: T.Y.B.Sc.** | **Division: A** |

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| **Academic year: 2025 - 2026** | **Semester: VI** | **Total Lectures: 45 + 30** |

**Course Objectives:**

1. Manipulate primitive data types in the R programming language using RStudio or Jupyter Notebook.

2. Control program flow with conditions and loops, write functions, perform character string operations, write regular expressions, handle errors.

3. Construct and manipulate R data structures, including vectors, factors, lists, and data frames.

4. Read, write, and save data files and scrape web pages using R. Understand and program machine learning algorithms.

**Course Learning Outcome:**

Upon completion of the course students should be able to::

**CO1.** Remember the basic concepts, terminologies and syntax of R programming.

**CO2.** Understanding of fundamental concepts and techniques in R programming.

**CO3.** Apply R programming concepts in data manipulation, visualization and machine learning algorithms.

**CO4.** Perform analysis on Data Sets for machine learning algorithms.

| Month | Lectures From: To: | No. of lectures allotted | Topic, Subtopic to be covered | Learning outcome | ICT Tools | Reference books |
|---|---|---|---|---|---|---|
| December | 01/12/2025 to 06/12/2025 | 03 | Basics of R: Basic Math, Variables, Data Types, Vectors, Calling Functions, Function Documentation, Missing Data, Pipes. | 1. Explain basics of R | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| December | 08/12/2025 to 13/12/2025 | 03 | Advanced Data Structures: DataFrames, Lists, Matrices, Arrays. | 1. Explain advanced data structures | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| December | 15/12/2025 to 23/12/2025 | 03 | Reading Data into R: Reading CSV's, Excel Data, Reading from Databases, Data from other Statistical Tools, R Binary Files, Data Included with R, Extract Data from Web Sites. Reading JSON Data. | 1. Explain reading data into R | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 02/01/2026 to 10/01/2026 | 03 | Statistical Graphics: Base Graphs, ggplot2. | 1. Explain Statistical graphics | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 12/01/2026 to 17/01/2026 | 03 | Writing R Functions: Hello World, Function Arguments, Return Values, do.call. | 1. Create R functions | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 19/01/2026 to 24/01/2026 | 03 | Control Statements: if and else, switch, ifelse, Compound Tests. | 1. Use control statements 2. Use Loops | Microsoft Powerpoint Presentation, | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |

| Month | Dates | | Topic | | Teaching Aids | Reference |
|---|---|---|---|---|---|---|
| | | | Loops, the Un-R Way to Iterate: for loops, while loops, Controlling Loops. | | LCD Projector | |
| January | 26/01/2026 to 31/01/2026 | 03 | Group Manipulation: Apply Family, aggregate, plyr, data.table. | 1. Perform group manipulation | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 02/02/2026 to 07/02/2026 | 03 | Faster Group Manipulation with dplyr: pipes, tbl, select, filter, slice, mutate, summarize, group_by, arrange, do, dplyr with Databases. | 1. Perform faster group manipulation with dplyr | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 09/02/2026 to 14/02/2026 | 03 | Iterating with purr: map, map with specified types, Iterating over a DataFrame, map with multiple inputs. | 1. implement iterations with purr | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 16/02/2026 to 21/02/2026 | 03 | Manipulating Strings: 15 paste, sprint, Extracting text, Regular Expressions. | 1. Apply manipulation of strings | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 23/02/2026 to 28/02/2026 | 03 | Linear Models: Simple Linear Regression, Multiple Regression | 1. Explain and use linear models | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 02/03/2026 to 07/03/2026 | 03 | Generalized Linear Models: Logistics Regression, Poisson Regression | 1. Explain and use generalized linear models | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |

| Month | Date | Hours | Topic | Learning Outcome | Teaching Aids | Reference |
|-------|------|-------|-------|------------------|---------------|-----------|
| March | 09/03/2026 to 14/03/2026 | 03 | Generalized Linear Models: Other Generalized Linear Models, Survival Analysis. | 1. Explain and use generalized linear models | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 16/03/2026 to 21/03/2026 | 03 | Nonlinear Models: Nonlinear Least Squares, Decision Trees, Random Forests. | 1. Explain and use Nonlinear models | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 23/03/2026 to 28/03/2026 | 03 | Clustering: K-Means, PAM, Hierarchical Clustering. | 1. Explain and use Clustering | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 30/03/2026 to 31/03/2026 | 03 | Revision | | Microsoft Powerpoint Presentation, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |

Practical Component

| Month | Lectures From: To: | No. of lectures allotted | Topic, Subtopic to be covered | Learning outcome | ICT Tools | Reference books |
|---|---|---|---|---|---|---|
| December | 01/12/2025 to 06/12/2025 | 02 | Introduction to RStudio, Writing and Running R in Jupyter Notebooks | 1. Install Rstudio and run R in Jupyter Notebooks | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| December | 08/12/2025 to 13/12/2025 | 02 | Hello World with R using RStudio Basic Math with R using Jupyter Notebook | 1. Perform Basic Math in R | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| December | 15/12/2025 to 23/12/2025 | 02 | Hands-on Lab: Operators | 1. Use operators | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 02/01/2026 to 10/01/2026 | 02 | Hands-on Lab: Data Structures (Vectors, Matrices) | 1. Create vectors and matrices and perform operations | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 12/01/2026 to 17/01/2026 | 02 | Hands-on Lab: Data Structures (DataFrames, Lists) | 1. Create DataFrames and Lists and perform operations | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 19/01/2026 to 24/01/2026 | 02 | Hands-on Lab: Loops and Conditions | 1. Implement loops and conditions | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and |

| Month | Date | | Topic | Objective | Resources | Reference |
|---|---|---|---|---|---|---|
| | | | | | | Graphics",2nd Edition, Pearson Education Inc.,. |
| January | 26/01/2026 to 31/01/2026 | 02 | Hands-on Lab: Functions | 1. Write functions and call them | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 02/02/2026 to 07/02/2026 | 02 | Hands-on Lab: Strings and Regular Expressions | 1. Perform String operations and regular expressions | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 09/02/2026 to 14/02/2026 | 02 | Hands-on Lab: Use statistical functions to compute function mean, standard deviation, statistical test on data(t-test) | 1. Use statistical functions | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 16/02/2026 to 21/02/2026 | 02 | Hands-on Lab: Loading data and saving files | 1. Implement loading and saving of files | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| February | 23/02/2026 to 28/02/2026 | 02 | Hands-on Lab: Probability distribution  Hands-on Lab: HTTP Request in R | 1. Perform probability distribution 2. Perform HHTP request in R | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 02/03/2026 to 07/03/2026 | 02 | Hands-on Lab: Webscraping in R | 1. Implement web scrapping | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and |

| | | | | | Graphics",2nd Edition, Pearson Education Inc.,. |
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| March | 09/03/2026 to 14/03/2026 | 02 | Visualizing data using R: Bar Chart, Histogram, Boxplot, Scatter plot | 1. Implement visualization of data in R | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 16/03/2026 to 21/03/2026 | 02 | Predictive modelling in R | 1. Use Predictive Modellling | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 23/03/2026 to 28/03/2026 | 02 | Predictive modelling in R | 1. Use Predictive Modellling | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |
| March | 30/03/2026 to 31/03/2026 | 02 | Revision | | R Studio, LCD Projector | Jared P. Lander(2018), "R for Everyone, Advanced Analytics and Graphics",2nd Edition, Pearson Education Inc.,. |