

# The University of the West Indies, St. Augustine Campus

## Intermediate R course July 2022

Rajesh Lakhan

**Level: Intermediate**

**Course Duration: 14 contact hours**

Dates: Monday 18 July 2022 - Sunday 24 July 2022.

Time : 5:00pm - 7:00pm

**Prerequisites:**

- R Beginner's Course.
- AND/OR On the job statistical experience/some prior statistical knowledge.

**Facilitator: Rajesh Lakhan**

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**Course Description**

R is a freely available statistical package that has grown in popularity. This course exposes students who are familiar with R the tools to carry out some of the more common inferential statistical procedures. The tenets of hypothesis testing as well as correlation and simple linear regression are covered. The course is easily accessible to those without a strong mathematical or statistical background.

**Content**

We will cover the following topics:

- Estimation Procedures
- Hypothesis Testing
- Correlation
- Analysis of Variance
- Simple Linear Regression

**Learning Objectives**

At the end of this course, you will be able to:

- Choose an appropriate technique based on the research question and data collected by the researcher.
- Interpret the output from R for some advanced statistical methods available in R.

## Detailed Course Content

This short course is organized into 8 sessions:

### Session 1

- Overview of Course
- Introduction into R
  - Installing Packages
  - Reading/Importing Data
  - Simple commands
- Data Manipulation
  - Ordering and Sorting Data
  - Tabulating data
  - Simple graphs (histograms and pie charts)
  - Data Exercise

### Session 2

- Estimation of Probability distributions
  - Binomial distribution
  - Poisson distribution
  - Exercises
- Covariance and correlation
  - Interpretation of covariance and correlathion
  - Correlation scatterplot
  - Exercises
- Hypothesis Testing (Theory)
  - Introduction to hypothesis testing
  - Formulating hypotheses
  - Testing hypotheses

### Session 3

- Review of hypothesis testing theory
  - Test Statistic
  - Critical Value
  - P-value
  - Confidence interval
- Hypothesis Testing using T-distribution
  - One-sample t-test
  - Two-sample t-test
    - \* Independent samples
    - \* Paired or dependent samples
  - Exercises

#### Session 4

- Normal Distribution
  - Standard Normal
- Hypothesis Testing using Normal-distribution
  - One-sample proportion test
  - Two-sample proportion test
  - Yates continuity correction
  - Exercises
- In-class exercises
  - To be enjoyed (attempted) by students

#### Session 5

- Independence Test
  - Chi-Squared distribution
  - One-way analysis
  - Two-way analysis
  - Exercises
- Correlation Tests
  - Pearson's correlation test
    - \* Shapiro-Wilk normality test
  - Spearman's correlation test
  - Exercises

#### Session 6

- Hypothesis Testing (3 or more samples)
  - Analysis of Variance [ANOVA] (parametric)
  - Kruskal Wallis (non-parametric)
  - Exercises
  - Two-way analysis
  - Exercises
- Comparison of means
  - Tukey's comparison test
  - Exercises

#### Session 7

- Completely randomized block design
  - Blocking
  - ANOVA table
  - Tukey's comparison test
  - Exercises
- Simple Linear Regression
  - Simple linear regression model -Significance of regression model
    - \* T-test and coefficient confidence intervals
    - \* ANOVA table and F-test
  - Plotting linear regression model
  - Exercises
- Closing Activities

## Intended Audience

This course is suitable for students, researchers, working professionals and other interested persons who have previously used R and want to expand their knowledge of statistical procedures within R software.

## Course Delivery Mode

- Interactive Zoom Sessions. Participants are expected to follow along in the session with their personal device.
- Presentations, code and practical exercises posted on:

<https://github.com/4Rajesh4/R-intermediate-July-2022> (*hyperlink*)

## Software

- R (and RStudio) is the software we will be using for this course.
- R is free to download for Windows, MAC and Linux operating systems at: <https://cran.r-project.org/> (*hyperlink*)

## Certification

A certification of Participation is awarded upon completion of the course, minimum attendance required.

## Resources

- R Installation Website: <https://cran.r-project.org> (*hyperlink*)
- <https://www.iiap.res.in/astrostat/tuts/intro2.html> (*hyperlink*)
- <https://www.rstudio.com/collections/rstudio-essentials> (*hyperlink*)
- <https://rmarkdown.rstudio.com/lesson-1.html> (*hyperlink*)

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