



# MGU INNOVATION FOUNDATION

(A Business Innovation Ecosystem of Mahatma Gandhi University)

Mahatma Gandhi University Campus, Priyadarsini Hills PO, Kottayam, Kerala



## 10-DAYS ONLINE INTERDISCIPLINARY WORKSHOP IN R PHYSICS, CHEMISTRY, MATHEMATICS & MANAGEMENT

### TOPICS TO BE COVERED



- GETTING STARTED WITH R AND RSTUDIO
- EXPLORING DATA STRUCTURES AND IMPORTING DATA
- DATA VISUALIZATION WITH BASE R AND GGPLOT2
- BASIC STATISTICAL ANALYSIS IN R
- DATA WRANGLING WITH dplyr
- EXPLORING DOMAIN-SPECIFIC PACKAGES – PART I
- EXPLORING DOMAIN-SPECIFIC PACKAGES – PART II
- WRITING FUNCTIONS AND USING LOOPS
- REPORT GENERATION WITH R MARKDOWN
- FINAL PROJECT – DOMAIN-SPECIFIC APPLICATIONS

Tools Used: ggplot2, ANOVA, dplyr, quantmod, ChemmineR, pracma, forecast etc.



**DR. SANDEEP. S**

ASSISTANT PROFESSOR & RESEARCH SUPERVISOR  
K. S. M. D. B COLLEGE

Registration Fee:

**Rs.2000**

REGISTER NOW



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For MG University/Affiliated College students 20% OFF



**JULY 28<sup>th</sup> 2025 – AUGUST 08<sup>th</sup> 2025**



**7.30 PM IST**

**Beneficiaries :** Research Scholars, PG Students, Teaching Faculties



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## 10-Days Online Interdisciplinary Workshop in R

### Physics, Chemistry, Mathematics & Management

**Dr. Sandeep. S Assistant Professor**

Research & Postgraduate Department of Chemistry

K.S.M.D.B College

**Note:** This course is structured to provide a comprehensive introduction to R programming with domain-specific applications. It is divided into three modules for progressive learning.

#### Module 1: R Fundamentals and Data Structures

##### 28/07/2025 Day 1: Getting Started with R and RStudio

###### Topics Covered:

- Installing R and RStudio
- RStudio interface tour (Console, Script, Environment, Plots)
- Basic operations and variables
- Data types: vectors and matrices
- **Application:** Physics – Storing experimental values

**Learning Objective:** Understand the R environment and perform basic data operations.

##### 29/07/2025 Day 2: Exploring Data Structures and Importing Data

###### Topics Covered:

- Lists, data frames, factors
- Importing/exporting data (CSV, Excel)
- Basic data manipulation
- **Application:** Management – Student database handling

**Learning Objective:** Work with essential data structures and data import/export operations.

## Module 2: Data Visualization and Statistical Thinking

### 30/07/2025 Day 3: Data Visualization with Base R and ggplot2

#### Topics Covered:

- Base R plotting
- Introduction to ggplot2
- Scatter plots, line graphs, bar charts
- **Application:** Chemistry – Reaction kinetics plots, FT IR data

**Learning Objective:** Create and interpret basic visualizations in R.

### 31/07/2025 Day 4: Basic Statistical

#### Analysis in R Topics Covered:

- Descriptive statistics
- Hypothesis testing: t-tests, ANOVA
- Correlation analysis
- **Application:** Mathematics – Probability distributions; Chemistry – Chemical reagent analysis

**Learning Objective:** Conduct and interpret basic statistical tests in R.

### 01/08/2025 Day 5: Data Wrangling with dplyr

#### Topics Covered:

- Filter, select, mutate, summarize
- Using pipes (%>%)
- Grouping operations
- **Application:** Management – Sales data analysis

**Learning Objective:** Manipulate and summarize datasets efficiently.

## Module 3: Advanced Packages and Reporting

### 04/08/2025 Day 6: Exploring Domain-Specific

#### Packages – Part I Topics Covered:

- pracma for numerical analysis (Physics)
- ChemmineR for cheminformatics (Chemistry)

**Learning Objective:** Use specialized packages for solving domain-specific problems.

### 05/08/2025 Day 7: Exploring Domain-Specific Packages

#### – Part II Topics Covered:

- forecast for time series analysis (Mathematics)
- quantmod for financial data analysis (Management)

**Learning Objective:** Analyze time series and financial data using R packages.



## 06/08/2025 Day 8: Writing Functions and Using

### Loops Topics Covered:

- Writing custom functions
- For/while loops
- apply family functions
- **Application:** All domains – Automating repetitive tasks

**Learning Objective:** Write modular code using functions and control structures.

## 07/0/2025 Day 9: Report Generation with R

### Markdown Topics Covered:

- Creating dynamic documents
- Integrating code, results, and text
- Exporting to HTML and PDF
- **Application:** Thesis/research reporting

**Learning Objective:** Generate professional and reproducible reports.

## 08/08/2025 Day 10: Final Project – Domain-Specific

### Applications Project Options:

- Physics: Analyzing pendulum experiment data
- Chemistry: Chemical concentration analysis
- Mathematics: Fibonacci sequence or time series modeling
- Management: Stock market trend analysis

**Learning Objective:** Apply acquired skills to a real-world domain-specific project.

**Note:** Applications span across disciplines. Participants are encouraged to select domains relevant to their academic or professional background.

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