NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech in Electronics and Instrumentation Engineering
Course Code:	2EIDE64
Course Title:	Introduction to R Programming
Course Type:	([] Core/[] Value Added Course/**[✓] Departmental Elective**/ [] Institute Elective/[]University Elective/[]Any other)
Year of introduction:	2023-2024

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
2	0	2	-	-	-	3

Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. explain various constructs of R language
2. formulate various statistical functions using R language
3. evaluate models using R language
4. analyze and plot the time series data

Syllabus: **Total Teaching hours:30**

Unit	Syllabus	Teaching hours
Unit-I	**Introduction** Overview of R, Basic syntax, script files, R data types and objects , operators and variables	02
Unit-II	**Decision making and loops** If statement, If else statement, switch statement, Repeat loop, for loop ,while loop, break and next statement	03
Unit-III	**Function and Strings** Function definitions, function components, Built in functions, User defined functions, Introduction to strings, Strings manipulation.	03
Unit- IV	**Vectors, list , matrices and arrays** Vector creation, Vector manipulation, creating list , naming ,accessing and manipulating list components, merging list, matrix computations, manipulating array elements, calculation using array elements	03

Unit- V	**Factors and data manipulation** Concept of data frame, Factors in data frame, generating factor levels , Extract data from data frame, expand data frame ,merging data frames, casting and melting.	**03**
Unit- VI	**Files managements in R** R-CSV files, reading and analysing CSV file, R- Excel file, xlsx package, reading excel files, R binary files, R-XML files, XML to data frame , R-JSON file , input data in JSON file, Convert JSON to data frame	**03**
Unit-VII	**Charts and Graphs** Pie charts, bar charts , box plots, histogram, line plots ,scatter plots	**03**
Unit-VIII	**Statistics examples and case studies** Linear regression, Multiple regression, nonlinear least square, decision tree, random forests, chi square test, time series analysis, case studies related to electronics and instrumentation applications.	**10**

Self-Study: The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work: Laboratory work will consist of minimum 10 experiments based on the above syllabus.

Suggested List of Experiments:

1. Installation and basic programming template for the R programming
2. To carry out the vector programming
3. To carry out the looping exercise for the given problems
4. To carry out the array programming
5. To perform the matrix operation using R programming
6. To carry out the data visualization using the various plot functions
7. To carry out the advanced data visualization using the ggplot2 function
8. To create functions for the given problem using R programming
9. To perform the linear and nonlinear regression using R programming
10. To carry out the clustering for the given data sets
11. To carry out the model evaluation using R programming
12. To perform the time series analyzing using R programming

Suggested Readings/ References:

1. Nina Zumel , John Mount, Jim Porzak , Practical Data science with R , Manning Publications
2. Robert Cabacoff, R in action : Data analysis and graphics in R , Manning Publication.
3. Richard Cotton, Learning R: A Step-by-Step Function Guide to Data Analysis,O' Relly Publications.
4. Norman Matloff, The art of R programming , No starch Press.
5. Mark Gardener, Beginning R, O' Relly Publications

Suggested Case List: -

L= Lecture, T=Tutorial, P= Practical, C= Credit

w.e.f. academic year 2023-24 and onwards.