

Session: 2026-27			
Part A – Introduction			
Subject	Mathematics/Statistics		
Semester	VI		
Name of the Course	MATLAB & R Software		
Course Code	MIC-7/VOC-3		
Course ID			
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	MIC/VOC		
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand MATLAB basics including variables, data types, vectors, matrices etc. 2. Have technical knowledge about built-in functions, MATLAB graphic features and its applications. 3. Deeper knowledge and understanding to generate plots. 4. Understand the R environment including installation, package management, and basic programming concepts such as loops and user-defined functions. 5. Learn tools and built in functions of MATLAB/R Software in solving stated problems.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Internal Assessment Marks	15	15	30
End Term Assessment Marks	35	35	70

Examination Time	2 Hours	---	100
Part B - Course Content			
Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.			
Unit	Topic	Contact Hours	
I	Introduction, starting and quitting a MATLAB session, Variables and assignments, Data types, Operators, Working with complex numbers, Defining a Vector, Accessing elements within a vector, Basic operations on vectors. Defining Matrices, Matrix functions and Matrix operations.	30 hrs	
II	Loops: For loops, While loops, Branching (conditional statements) - if statement, If else statement, Else if statement. Solving a linear system, finding eigenvalues and eigenvectors. Polynomials: Representing Polynomials and Polynomial roots. Graphs and plots: Basic 2-D plots, Overlay plots, specialized 2-D plots, 3-D plots, Interpolated surface plots, saving and printing graphs.		
III	Overview of the R language: Installing R and R Studio, Text editors for R, Graphical User Interfaces (GUIs) for R, Creating and storing R workspaces, installing packages and libraries, Mathematical operations. Data Types in R – Numeric, Integer, Character, Logical, Complex and missing data. Data Structures in R • Vectors – Creation, Arithmetic operations of Vectors, Vector Sub setting, Sorting and Sequencing functions. • Matrix and Arrays – Creation, Arithmetic Operations of matrix, Sub setting, Use of Drop Function. • Factors – Converting a vector into factor, assigning levels and labels, ordered Factor. • List – Creating a list, accessing elements from a list, adding a new element and eliminating an existing element from the list, converting list to vectors.		

IV	Data Frames – Creation of Data Frame, adding new columns, rows and removing columns, accessing column using the \$ sign, importing a data set (important file formats such as csv, txt and spreadsheet), aggregate function and subsetting of data frames. Programming Fundamentals: Logical operators, conditional statements (if, else, else if statements in R), While loops, for loops, repeat loops. Creating functions in R. Reading data in R (file formats such as csv, txt, and xls), Writing data to external files (file formats such as csv, txt, and xls), writing a table to a file, print function.	
Practical		
The following Practicals numbered 1 to 10 will be performed using MATLAB / SCILAB software, while practicals numbered 11 to 17 will be performed using R software and record of those will be maintained in the practical note book: 1. Practical to demonstrate components in MATLAB/SCILAB environment. 2. Practical to demonstrate tool boxes in MATLAB/SCILAB environment. 3. Practical to demonstrate windows in MATLAB/SCILAB. 4. Program to generate odd/even numbers. 5. Practical to demonstrate basic matrix operations (addition, subtraction, multiplication, transpose, determinant, etc.). 6. Practical to find inverse of a matrix using built-in function. 7. Practical to determine Eigen values and Eigen vectors of a square matrix using built-in functions. 8. Find the roots of the equations using MATLAB. 9. Write a program to show the use of if else structure in MATLAB. 10. Write a program to show the use of FOR loop in MATLAB. 11. Practical to add title, axis labels, line style, color, annotations etc. to a figure/graph. 12. Practical to demonstrate statistical toolbox (mean, median, standard deviation, sort etc.). 13. Program to perform basic mathematical operations in R (addition, subtraction, multiplication, division, powers). 14. Program to create and display Numeric, Integer, Character, Logical, and Complex data types. 15. Program to perform arithmetic operations on vectors. 16. Program to generate sequences and sorting of sequence. 17. Program to perform basic matrix operations. 18. Program demonstrating logical operator if, if-else and else if ladder statement. 19. Program demonstrating for loop and while loop.		60 hrs
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory 15 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 5 ➤ Practicum 15 • Seminar/Demonstration/Viva-voce/Lab records etc.: 15	End Term Examination: ➤ Theory 35 • Written Examination ➤ Practicum 35 • Lab record, viva-voce, write up and execution of the program
Part C-Learning Resources	
Recommended Books: 1. S. J. Chapman (2020), <i>MATLAB Programming for Engineers (6th Edition)</i>, Cengage Learning. 2. W. Palm III (2017), <i>A Concise Introduction to MATLAB (2nd Edition)</i>, Tata McGraw-Hill Education. 3. R. Pratap (2010), <i>Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers</i>, Oxford University Press. 4. R. K. Bansal, A. K. Goel and M. K. Sharma (2009), <i>MATLAB and Its Applications in Engineering</i>, Pearson Education India. 5. S. R. M. Sekhar et al. (2017), <i>Programming with R</i>, Cengage Learning India. 6. M. Gardener (2018), <i>Beginning R: The Statistical Programming Language</i>, Wiley & Sons	

