FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

EEIEVAC04- DATA ANALYSIS, VISUALIZATION AND SCIENTIFIC COMPUTATION WITH MATLAB

COURSE OBJECTIVES

The main objectives are:

Understanding the MATLAB environment

Being able to do simple calculations using MATLAB

Being able to carry out simple numerical computations and analyses using MATLAB

Unit I Introduction

Introduction to MATLAB-Getting into MATLAB- Constants (Built-in Constants) Variables-Assignment Statements-Operators and and Expressions-Operator precedence-Vectors and Matrices-Simple MATLAB Scripts-User defined functions-passing arguments to functions.

Unit II **Data Import-Export Utilities**

Creating random data-Importing and Exporting Data -Importing Data into the Workspace -Exporting Data from the Workspace -Importing data to Excel files- Exporting Data from the Excel files- Using MAT-Files for Variables-Saving and loading MATLAB variables-Problems with importing formatted data-MATLAB commands to import audio, image and video formats.

Unit III **Statistical Functions**

MATLAB Statistical Functions-minimum-maximum-sum-product-meanstandard deviation-mode-median-Built in functions for set operations like Union, Intersection, Unique set, set difference and set exclusive OR- Sorting operation - sorting elements within a vector - sorting rows within a matrix by values in a column- variance of a vector - covariance of a matrixcorrelation coefficient function.

(6 hours)

(5 hours)

(5 hours)

Unit IV Graphics and Visualization

Basic plotting function- subplots- Customizing Plots- Logarithmic plots-Histograms and Barchart-3D plots functions- Creating mesh and surface plots- contour functions- other 3D plot functions- Display images- Printing graphics- Introduction to Graphical User Interface(GUIs).

Unit V Data Analysis Methods

(8 hours)

Matrix solutions to systems of Linear Algebraic Equation- Curve Fitting-Interpolation and Extrapolation-Regression -Finding roots of polynomials-Visualizing solution of Ordinary Differential Equations (ODEs) and Partial Differential Equations (PDEs).

Graphical User Interface(GUIs) for Signal Processing, Neural Network, Fuzzy Logic, Adaptive Neural Fuzzy Inference Systems (ANFIS).

COURSE OUTCOMES

- 1. Able to use MATLAB for interactive computations.
- 2. Familiar with memory and file management in MATLAB.
- 3. Able to generate plots and export this for use in reports and presentations.
- 4. Write simple programs in MATLAB to solve scientific and mathematical problems

REFERENCES

- 1. Stormy Attaway, Matlab: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann; 4th edition, 2016.
- 2. Brian Hahn and Dan Valentine, Essential MATLAB for Engineers and Scientists, Academic Press; 6th edition, 2016.
- 3. Stormy Attaway, Matlab: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann, 5th edition, 2018.
- 4. C. Henry Edwards, David E.Penney, David Calyis, Differential Equations: Computing and Modeling (5th Edition) (Edwards, Penney & Calvis, Differential Equations: Computing and Modeling Series) Pearson, 5th Edition, 2014.

(6 hours)