

# **[Module-1][Updated]: MATLAB Programming Concepts**

**Objective:** After doing this module you will be much confident about MATLAB Programming and able to write MATLAB Code for a given problem, understand the previous written code and debug yours or others MATLAB codes. Finally get little idea about Simulink model based design also.

## **MATLAB Basics:**

Introduction to MATLAB, Get familiar with MATLAB Environment, Get familiar with MATLAB Commands, How to write Mathematical Expressions in MATLAB, Variables and Arrays, Multidimensional arrays, Scalar & Array Operations, Initializing variables in MATLAB, Reading data from notepad and excel/csv files, reading data from audio and video files, Reading and visualize image data, reading data from webcam, Displaying Output data,

## **Plotting:**

Introduction to Plotting, Multiple Plots, Subplots, Additional 2D plots: logarithmic, Bar, stem, stair, pi, polar, histogram, compass; 3D Plots: Mesh, Surf, waterfall, contour, patch, cone, sphere etc.; Additional Plotting Features: Axis control, tick control, change line type and color, Change marker type and style, Change font style and size, stream modifiers: write subscript and superscript, write mathematical symbols in MATLAB figure, Add text on graph.

## **Loops and Control Statements:**

Top down design technique, Need of Control statement, Operators: Arithmetic, Relational and Logical, Hierarchy of operators; if construct, Nested if construct, Switch construct, try and catch construct, while loop, for loop, nested loops, Break and continue, loop based problems.

## **Functions:**

How to create a user defined function, convert a MATLAB script to a MATLAB function, Types of functions: Anonymous function, Sub-functions, Nested functions, Private functions, Global data sharing, Preserve data between calls, String Functions.

## **MATLAB Advance concepts:**

Cell Arrays, Sparse Arrays, Structures, Function handles, Graphics handles, data importing through functions, Table handling, Live scripting and publishing of formatted codes and results in pdf, html and Latex.

## **Control Systems:**

Polynomial handling, Transfer function representation, pole-zero diagram, state space model, series/cascade, parallel and feedback systems, step and Impulse responses, Root locus, Bode plot, gain margin, phase margin, Nyquist plot.

## **Numerical Computation Techniques:**

Symbolic mathematics toolbox, Integration, Differentiation, Laplace transforms, Z-transform, Ordinary Differential Equations: Euler's method, Runga Kutta methods, Non-linear equations Newton-Raphson method, Interpolation, extrapolation, curve fitting toolbox.

## **Debugging:**

Spot an error in previously written code, deep understanding of the MATLAB programs, run program line by line.

## **Getting MATLAB help**

Offline help, online help

## **Simulink:**

Introduction to Model based design, scope in Industry, and few design examples.