

# CERTIFIED IN MATLAB PROGRAMMING

Contact: 9640648777

Duration: 30 days

## **MATLAB PROGRAMMING**

### **Introduction**

- Obtain a quick overview of The Math Works and MATLAB
- Discuss course set-up
- Evolution of the language
- Features of Mat lab

### **Working with the MATLAB User Interface**

- Command window
- Command History
- Workspace
- Reading and writing data

### **Variables and Expressions**

- Entering commands
- Creating variables
- Getting help
- Accessing and modifying values in variables

### **Operators**

- Operators classification
- Arithmetic operators
- Relational operators
- Logical operators
- Assignment operator
- Semicolon operator
- Colon operator
- Typecasting operator

### **Flow Control**

- Simple if
- If - else
- Else if
- Nested if
- Switch
- For loop
- While loop

### **Writing Functions**

- Creating functions
- Calling functions
- Sub functions



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## Data Types

- MATLAB® data types
- Integers
- Structures
- Function handles

## Analysis and Visualization with Vectors

- Calculations with vectors
- Plotting vectors
- Basic plot options
- Annotating plots

## Analysis and Visualization with Matrices

- Size and dimensionality
- Calculations with matrices
- Multidimensional arrays

## Graphics

- 2Dimensional plots
- 3Dimensional plots
- Contour plots

## File I/O

- Opening and closing files
- Reading and writing text files
- Reading and writing binary files

## Graphical User Interfaces

- GUIDE introduction
- Designing the GUI
- Programming the GUI

## **Matlab Image Processing Training**

We provide hands-on experience with performing image analysis. Examples and exercises demonstrate the use of appropriate MATLAB® and Image Processing Toolbox™ functionality throughout the analysis process. Topics include:

- Importing and exporting images
- Analyzing images interactively
- Removing noise
- Aligning images and creating a panoramic scene
- Detecting lines and circles in an image

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- Segmenting object edges
- Segmenting objects based on their color and texture
- Performing batch analysis over sets of images
- Segmenting objects based on their shape using morphological operations
- Measuring shape properties

## Course Objective:

### Importing and Visualizing Images

**Objective:** Import image or video frames into MATLAB and visualize them. Convert images to a format that is useful for analysis.

- Importing and displaying images
- Converting between image types
- Exporting images
- Importing and playing video files

### Interactive Exploration of Images

**Objective:** Explore object details such as shape, texture, and color and create a custom image exploration tool.

- Obtaining pixel intensity values
- Extracting a region of interest
- Computing pixel statistics on a region of interest
- Measuring object sizes
- Creating a custom interactive tool

### Preprocessing Images

**Objective:** Perform image preprocessing operations and apply custom functions to images.

- Adjusting image contrast
- Reducing noise in an image
- Using sliding neighborhood operations
- Using block processing operations

### Spatial Transformation and Image Registration

**Objective:** Align images to use the same scale and orientation. Compare aligned images. Create a panoramic scene by stitching images.

- Geometric transformations
- Image registration using point mapping
- Creating a panoramic scene

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## Matlab Image Processing Training

We show how to analyze signals and design signal processing systems using MATLAB, Signal Processing Toolbox™, and DSP System Toolbox.



### Topics include:

Creating and analyzing signals

- Performing spectral analysis
- Designing and analyzing filters
- Designing multi-rate filters
- Designing adaptive filters

### Course Objective:

#### Signals in MATLAB

**Objective:** Generate sampled and synthesized signals from the command line and visualize them. Create noise signals for a given specification. Perform signal processing operations like re-sampling, modulation, and correlation.

#### Creating discrete signals

Sampling and re-sampling

- Visualizing signals
- Modeling noise
- Performing re-sampling, modulation, and correlation
- Generating streaming signals

#### Spectral Analysis

**Objective:** Understand different spectral analysis techniques and the use of windowing and zero padding. Become familiar with the spectral analysis tools in MATLAB and explore nonparametric (direct) and parametric (model-based) techniques of spectral analysis.

Discrete Fourier transform

- Windowing and zero padding
- Power spectral density estimation
- Time-varying spectra
- Using a spectrum analyzer in MATLAB

#### Linear Time Invariant Systems

**Objective:** Represent linear time-invariant (LTI) systems in MATLAB and compute and visualize different characterizations of LTI systems.

LTI system representations

- z-transform
- Frequency and impulse response
- Visualizing filter properties
- Applying filters to finite and streaming signals

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## Matlab Simulink Training

### Simulink for System and algorithm Modeling

we provide training in algorithm modeling and design validation in Simulink. It demonstrates how to apply basic modeling techniques and tools to develop Simulink block diagrams.



#### Topics include:

Creating and modifying Simulink models and simulating system dynamics  
Modeling continuous time, discrete time, and hybrid systems  
Modifying solver settings for simulation accuracy and speed  
Building hierarchy into a Simulink model  
Creating reusable model components using subsystems, libraries, and model references

#### Creating and Simulating a Model Objective:

Create a simple Simulink model, simulate it, and analyze the results.  
Define the potentiometer system  
Explore the Simulink environment interface  
Create a Simulink model of the potentiometer system  
Simulate the model and analyze results

#### Programming Constructs Objective:

Model and simulate basic programming constructs in Simulink.  
Comparisons and decision statements  
Zero crossings  
MATLAB Function block

#### Modeling Discrete Systems

##### Objective:

Model and simulate discrete systems in Simulink.  
Define discrete states  
Create a model of a PI controller  
Model discrete transfer functions and state space systems  
Model multirate discrete systems

#### Modeling Continuous Systems

##### Objective:

Model and simulate continuous systems in Simulink.  
Create a model of a throttle system  
Define continuous states  
Run simulations and analyze results  
Model impact dynamics



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## **Solver Selection Objective:**

Select a solver that is appropriate for a given Simulink model.

- Solver behavior
- System dynamics
- Discontinuities
- Algebraic loops

## **Developing Model Hierarchy Objective:**

Use subsystems to combine smaller systems into larger systems.

- Subsystems
- Bus signals
- Masks

## **Modeling Conditionally Executed Algorithms Objective:**

Create subsystems that are executed based on a control signal input.

- Enabled subsystems
- Triggered subsystems
- Input validation model

## **Combining Models into Diagrams Objective:**

Use model referencing to combine models.

- Model referencing and subsystems
- Model referencing workflow
- Setup a model reference
- Model reference simulation modes
- Store parameters in referenced models

## **Creating Libraries Objective:**

Use libraries to create and distribute custom blocks.

- Create and populate libraries
- Manage library links
- Add a library to the Simulink Library Browser