# Course & Kit Content

# Of

# MATLAB with Robotics

# Duration 15 Days

## Kit Partner


Corporate Office
Robosapiens Technologies Pvt. Ltd.
B 5, Block 'C', Sector-31,
Noida-201301

Email: info@robosapi.com/
Website: http://www.robosapi.com

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|---|---|
| Course Name | : **MATLAB with Robotics** |
| Certification | : By Robosapiens Technologies Pvt. Ltd. |
| Toolkit | : **FREE** to Each Participant |

## Detailed Course Content:

### 1. Introduction to Basic MATLAB Concepts

1.1. What is MATLAB
1.2. The dominance of MATLAB over other languages
1.3. Power of Matrix computations
1.4. Saving and loading a MAT-file
1.5. MATLAB's Command Prompt
1.6. Basic Reading and Writing Data from a File
1.7. The application of MATLAB in various fields of engineering
1.8. MATLAB Environment

### 2. Introduction to Data Storage and Manipulation

2.1. Data Types and Operations on Point Values
2.2. Boolean and Rational
2.3. Strings
2.4. Portable Functions
2.5. Complex Numbers

### 3. Arrays and Matrices

3.1. What is an array?
3.2. Introduction to array operations
3.3. Vectors and basic vector operations
3.4. Structure Arrays
3.5. Cell Arrays
3.6. Sparse Matrices

### 4. Introduction to Mathematical Manipulations

4.1. Linear Algebra
4.2. Simple matrix manipulation
4.3. More complicated matrix operations
4.4. Differential Equation

4.5. Ordinary Differential Equations
4.6. Partial Differential Equations
4.7. Various Flow Control used in MATLAB
4.8. 2D & 3D graphical Plotting

## 5. Introduction to Image Processing

5.1. What is Image Data
5.2. Image Processing Toolbox
5.3. Importing Image
5.4. How to build a matrix image
5.5. Image Display
5.6. Image Operations
5.7. Image Conversion

## 6. Image Arithmetic

6.1. Adding Images
6.2. Multiplying Images
6.3. Dividing Images
6.4. Spatial Transformation
6.5. Resizing Images
6.6. Rotating Images
6.7. Cropping Images

## 7. Image Filtration

7.1. What is Image Restoration
7.2. Noise and Images
7.3. Noise Models
7.4. Noise removal using spatial domain filtering
7.5. Periodic noise
7.6. Noise removal using frequency domain filtering

## 8. Image Processing Tool

8.1. Display & Exploration
8.2. Geometric Transformation, Spatial Referencing and Image Registration
8.3. Image Enhancement
8.4. Image Analysis
8.5. Image Import, Export & Conversion

## 9. Morphological Image Processing

9.1. Mathematic Morphology
9.2. Z2 and Z3
9.3. Basic set theory
9.4. Logic Operations
9.5. Structuring Element
9.6. How to describe Structuring Element
9.7. Basic Morphological Operations
9.8. Erosion
9.9. Dilation
9.10. Combining Erosion and Dilation
9.11. Filtering Application

## 10. Introduction to Graphical User Interface

## 11. Introduction to Robotics

11.1. History of Robotics
11.2. Why Robotics
11.3. How Robotics works
11.4. Application of Robotics
11.5. Current Industrial Robotics
11.6. Future of Robotics

## 12. Introduction to Sensors

12.1. What is Sensor?
12.2. Various Basic Industrial Sensors-IR- Analog Sensor
12.3. IR Digital Sensor
12.4. Selection of Sensor
12.5. Basic working Technique of Sensor
12.6. Application of Sensor
12.7. How to Interface Sensor
12.8. How to Design Analog/Digital Sensors

## 13. Introduction to Computational Devices

13.1. What is Computational Device?
13.2. Microprocessor
13.3. Microcontroller
13.4. Difference B/W Various Computational Devices

13.5. Application of various Computational Devices
13.6. Selection of Computational Device
13.7. How to use Various Computation Device
13.8. Work on AVR Family with Mega Series (ATmega8)

**14. How to work on Educational & Engineering Level Actuator**

14.1. DC Motor
14.2. DC Geared Motor

**15. Introduction to Driving System/Locomotion**

15.1. What is Driving System?
15.2. Various Types of Driving System
15.3. Why need Driving System

**16. Introduction to Programming Languages**

16.1. Various programming Languages
16.2. Selection of programming Language
16.3. Need of Flow Diagram
16.4. How to write First "LED BLINKING" Code in Embedded 'C'
16.5. Why always First "LED BLINKING" Code?
16.6. Practice on various LED Pattern
16.7. Debugging of Error Program

**17. Interfacing of Anatomy of Robot**

17.1. Assembling of Robot

**18. Introduction to LCD Display**

18.1. Pin Description of 16x2 LCD Display
18.2. Application of 16x2 LCD Display
18.3. Programming of 16x2 LCD Display

**19. Introduction to USART**

19.1. Mode of Communication
19.2. Types of Communication Protocol
19.3. Difference between Different Communication Protocol (I2C, SPI, UART )
19.4. USART Registers

19.5. Programming USART

**20. Application and Demos**

## LIVE Projects Covered:

1. LED Blinking
2. Running LEDs
3. Sand Glass Filling of LEDs
4. Decoration LEDs/ LED Patterns Etc.
5. Sensor Interfacing
6. DC Motor Driving
7. Black Line Follower using two IR-Sensor
8. White Line Follower using two IR-Sensor
9. Wall follower Robot
10. Edge Avoider Robot
11. Intelligent Line Follower Robot
12. Displaying your Name on LCD
13. Scrolling Text on LCD
14. Blinking Text on LCD
15. PC to µC Communication
16. µC to PC Communication
17. Computer Keyboard Controlled Robot
18. 2D & 3D Graphical Representation
19. Image Comparison
20. Image Pairing
21. Matrices Manipulation
22. Filtering of Noise
23. Red Object Detection
24. GUI Based Calculator
25. GUI Based Image Transforms
26. GUI Switch Controlled Robot
27. Ball Tracker Robot
28. Collision Avoidance Robot

## 15 Days KIT Contains:

| S. No. | Name of the Component | Quantity | Figure |
|---|---|---|---|
| 1 | Robosapien's Atmega8 Development Board | 1 |  |
| 2 | USB Cable A to B Type | 1 |  |
| 3 | Robosapien's Educational and Software Material CD | 1 |  |
| 4 | IR Digital Sensor | 2 |  |
| 5 | 150 RPM Single Shaft BO Rectangle | 2 |  |
| 6 | Robosapiens Caster Wheel | 1 |  |
| 7 | Robosapiens 76mm Wheel | 2 |  |
| 8 | Robosapiens Chassis Board | 1 |  |
| 9 | Screw Driver | 1 |  |
| 10 | Nut Bolt Packet | 1 |  |
| 11 | Robomart USB to TTL Bridge | 1 |  |
| 12 | 2X16 LCD Display | 1 |  |
| 13 | 4 PIN Female to Female Jumper Wire | 1 |  |

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|---|---|---|---|
| 14 | 3 PIN Female to Female Jumper Wire | 1 |  |
| 15 | 1 PIN Female to Female Jumper Wire | 4 |  |
| 16 | Paper Beg/Box | 1 |  |