

# Embedded Systems & Robotics (Summer Training Program) 6 Weeks/45 Days

**“PRESENTED BY”**



Accredited by:



**INTERNATIONAL  
ACCREDITATION  
ORGANIZATION  
HOUSTON U.S.A.**

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# SUMMER TRAINING PROGRAM

## Robotics & Embedded Systems

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<b>Course Name</b>	: Robotics & Embedded Systems
<b>Certification</b>	: By RoboSpecies Technologies Pvt. Ltd. Accredited by International Accreditation Organization, Houston, U.S.A.
<b>Study Material</b>	: Books & CDs Free to each participant
<b>Robotics Toolkit</b>	: Free to Each Participant

**Projects:** 60 Projects Covered in 45 Days (excluding major optional Projects)

### Fees & Duration

1. For Robotics & Embedded Systems (**ADVANCE**)

**Fees** : ₹ 9,990/- per candidate

**Duration** : 45 Days/6 Weeks

ADVANCE MODULE – Robotics & Embedded Systems	
DAYS	TOPICS
Day 1	<p><b>Theory</b></p> <p>Introduction to Robotics</p> <ul style="list-style-type: none"><li>• Introduction to Extensive Field of ROBOTICS</li><li>• Application of Robotics: Industrial, Medical, Entertainment.</li><li>• Introduction to Embedded System</li><li>• Basics of hardware and software</li><li>• New and Upcoming Technologies</li></ul>
Day 2	<p><b>Theory</b></p> <p>Introduction to Manual Robotics</p> <ul style="list-style-type: none"><li>• Different types of Manual Robots.</li><li>• Motor Principle explanation.</li><li>• DPDT connections demystified.</li><li>• Gear assembly and calculations.</li><li>• Different types of chassis designing.</li><li>• Controlling Motors using DPDT.</li><li>• Concept of different types of competitions, events.</li></ul> <p><b>Practical</b></p> <ul style="list-style-type: none"><li>• Manual Robotics practical session</li><li>• Assembling of a robotic car</li></ul>

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Day 3	<p><b>Theory</b></p> <ul style="list-style-type: none"><li>• Introduction to electronics</li><li>• Applications of electronics</li><li>• Electronics components explanation</li><li>• Voltage divider rule</li><li>• Introduction to analog Circuits.</li><li>• Introduction to breadboard.</li></ul> <p><b>Practical</b></p> <ul style="list-style-type: none"><li>• Interfacing components like LED, Resistor etc</li><li>• Generating different colors from RGB LED</li><li>• LDR based Automatic light control.</li><li>• Transistor as an amplifier.</li><li>• Transistor as a NOT gate.</li></ul>
Day 4	<p><b>Theory</b></p> <ul style="list-style-type: none"><li>• Basic Circuit Development</li><li>• Input output processing in electronic circuits</li><li>• Operation of Active and Passive components</li></ul> <p><b>Practical</b></p> <ul style="list-style-type: none"><li>• Transistor as a Touch Switch.</li><li>• Controlling brightness of LED using potentiometer.</li><li>• Interfacing 555IC for LED blink.</li><li>• Interfacing 555IC for buzzer beep.</li></ul>
Day 5	<p><b>Theory</b></p> <ul style="list-style-type: none"><li>• Introduction to Autonomous Robots.</li><li>• Tangible and Non-tangible interfacing.</li><li>• Interaction between real and digital world.</li><li>• Concepts of artificial intelligence.</li><li>• Introduction to Infrared light.</li><li>• Introduction to IR Sensors.</li><li>• Op-amp operation.</li><li>• Op-amp as a Comparator.</li></ul> <p><b>Practical</b></p> <ul style="list-style-type: none"><li>• Testing of IR sensors.</li><li>• Detecting white and black surface with digital IR sensors.</li><li>• IR range detection.</li><li>• Monitoring analog and digital sensors.</li></ul>
Day 6	<b>PROJECT</b>
Day 7	<b>PROJECT</b>

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## Robotics & Embedded Systems

DAYS	TOPICS
Day 8	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• L293D IC Explanation.</li> <li>• Core of L293D vis-s-vis <b>H- BRIDGE concept</b> .</li> <li>• Concept of Embedding L293D IC in MOTOR DRIVER shield.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Making Connections of L293D IC on BREAD BOARD.</li> <li>• Driving Motors with L293D on Bread Board.</li> </ul>
Day 9	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Welcoming LINE FOLLOWER CONCEPT.</li> <li>• Interface Motor Driver with IR sensor.</li> <li>• Calibration of IR sensors               <ul style="list-style-type: none"> <li>• What is it?</li> <li>• Why is it required?</li> </ul> </li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Calibrating IR sensors.</li> <li>• Make your Own <b>LINE FOLLOWER</b>.</li> <li>• Make your Own <b>OBSTACLE DETECTOR</b>.</li> <li>• Make your Own <b>EDGE AVOIDER</b>.</li> </ul>
Day 10	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Microcontrollers and Microprocessor difference</li> <li>• Introduction to embedded system</li> <li>• Video sessions on advancements in Technology</li> <li>• Concepts of hardware and software interface</li> <li>• Introduction to Arduino</li> <li>• Arduino IDE and Overview.</li> <li>• Introduction to different Arduino boards and shields.</li> <li>• Working on digital and analog signal.</li> <li>• What is Future Technology Devices International Ltd.(FTDI)</li> <li>• Microcontroller ATMEGA 328.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Introduction to BASIC PROGRAMMING.</li> <li>• Driver and software installation.</li> <li>• Better understanding using the 13<sup>th</sup> pin internal Connection.</li> </ul>

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## Robotics & Embedded Systems

DAYS	TOPICS
Day 11	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to Basic Shield.</li> <li>• What is the requirement of Basic Shield?</li> <li>• Operation of Analog and Digital Signals.</li> <li>• 8 Bit and 10 Bit Concept.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing Basic Shield with Arduino.</li> <li>• Lighting up several LED's in a Wishful Pattern.</li> <li>• Working on Switch, BUZZER and implementing with Arduino for better grasping of concepts.</li> </ul>
Day 12	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• How to integrate motors through sensors.</li> <li>• Why Arduino required interfacing Motors through Sensors.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing Motors through sensors via Arduino.</li> <li>• Making your own <b>INTELLIGENT LINE FOLLOWER</b> using ARDUINO.</li> <li>• Proper Calibration for efficient line following.</li> </ul>
Day 13	Completion of line follower, obstacle detector, edge avoider
Day 14	Competition, Doubts & Practical Session
Day 15	<b>PROJECT</b>
Day 16	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Serial and Parallel Communication.</li> <li>• Hello to Analog I/P and O/P.</li> <li>• Introduction to ADC.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing Potentiometer and LDR with ARDUINO.</li> <li>• Interfacing Motor Driver with ARDUINO.</li> <li>• Speed Control of Motors using PWM.</li> </ul>
Day 17	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to DTMF Technology.</li> <li>• Effectiveness of This Technology.</li> <li>• Several Mobile controlled applications.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Integrating DTMF with motors.</li> <li>• Remotely controlling of robots.</li> </ul>

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## Robotics & Embedded Systems

DAYS	TOPICS
Day 18	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to GSM based technology</li> <li>• Effectiveness of This Technology.</li> <li>• 8870 Decoder IC</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Integrating DTMF with motors.</li> <li>• Remotely controlling of robots.</li> </ul>
Day 19	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to LCD.</li> <li>• Pin Description of LCD's.</li> <li>• How to interface LCD with ARDUINO.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Creating simple animations on LCD.</li> <li>• Scrolling texts on LCD.</li> <li>• Integrating Digital Signals</li> </ul>
Day 20	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Advance LCD Display Patterns</li> <li>• Detailed Explanation of LCD</li> <li>• Different LCD Display</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Robot Movement Display</li> <li>• Designing Counter on LCD</li> </ul>
Day 21	<b>PROJECT</b>
Day 22	<b>PROJECT</b>
Day 23	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Seven Segment Display.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Making Connections of SSD with Arduino.</li> <li>• Integration of SSD with analog and digital signals.</li> <li>• Digital Clock Designing.</li> <li>• Making Own pattern of Displaying numbers on SSD.</li> </ul>
Day 24	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Integrating keypad Matrix with motors</li> <li>• Keypad interfacing with ATMEGA 328</li> <li>• ON/OFF LED/Motor/Buzzer using linear keypad</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Password Controlled application – ATM prototype</li> </ul>

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DAYS	TOPICS
Day 25	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Understanding Ultrasonic sensor.</li> <li>• Utilising to detect range or distance.</li> <li>• Range or distance calculations.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• i n terfacing with ARDUINO.</li> <li>• Reading values of Ultrasonic sensor at several points in SERIAL MONITOR.</li> </ul>
Day 26	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Advance Concepts of ULTRASONIC SENSOR.</li> <li>• Ultrasonic sensor as a range finder</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Utilizing the readings for RADAR applications.</li> <li>• Concept of integrating with actuators.</li> </ul>
Day 27	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Integrating different Sensors and Actuators</li> <li>• Understanding designing of Advanced Robot</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Integrating LCD and Robot Car</li> <li>• Integrating Seven Segment Display and Robot Car.</li> </ul>
Day 28	<b>PROJECT</b>
Day 29	Competition, Doubts & Practical Session
Day 30	<b>PROJECT</b>
Day 31	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to soldering.</li> <li>• Introduction to LED Matrix.</li> <li>• Explanation of several combinations to make a pattern display.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Soldering LED's on Zero PCB.</li> <li>• Display digits on LED Matrix.</li> <li>• Generating patterns on LED Matrix (e.g. SMILEYS).</li> <li>• Display of text on LED Matrix.</li> </ul>
Day 32	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Arduino serial communication</li> <li>• Math &amp; Serial</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Mathematical calculations</li> <li>• Serial Communication Advancement</li> </ul>

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DAYS	TOPICS
Day 33	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to MATLAB</li> <li>• Basics of MATLAB Programming</li> <li>• Digital Laboratory Explanation</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Mathematical Calculations using MATLAB</li> <li>• Command window, Workspace, Command History</li> <li>• Sub plotting the Matrix functions, Editing Plots</li> </ul>
Day 34	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Integrating MATLAB with Microcontroller</li> <li>• 2D-3D Plots</li> <li>• Basics of Image Processing</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Reading and Writing Images</li> <li>• Serial and Parallel data interfacing</li> </ul>
Day 35	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Integrating MATLAB with Arduino</li> <li>• 2D-3D Plots</li> <li>• Image Processing</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Transfer of Bit by Bit data</li> <li>• Controlling actuators using MATLAB</li> <li>• Designing LED Pattern using MATLAB</li> </ul>
Day 36	<b>PROJECT</b>
Day 37	<b>PROJECT</b>
Day 38	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Working on Pixels</li> <li>• Graphical Formats in MATLAB</li> <li>• Integrating MATLAB with Seven Segment Display</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Color Conversion</li> <li>• Graphical Conversion of Format</li> <li>• Color Masking</li> <li>• Interfacing MATLAB with Seven Segment Display</li> </ul>



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## Robotics & Embedded Systems

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DAYS	TOPICS
Day 39	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to Image Acquisition</li> <li>• Live Videography using MATLAB</li> <li>• Integrating Real world with digital world</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Installing Web cam with MATLAB</li> <li>• Clicking image using MATLAB</li> <li>• Live Edge detection</li> <li>• Object Tracking Robot</li> </ul>
Day 40	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to Accelerometer</li> <li>• Working on 2-3 Axis using Accelerometer</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing Accelerometer with Microcontroller</li> <li>• Reading data on Serial Monitor</li> <li>• Interfacing Basic Shield with Accelerometer</li> </ul>
Day 41	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Advanced Accelerometer Applications</li> <li>• Transfer of Analog Data using Accelerometer</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Gesture Controlled Robot</li> <li>• Speed Controlled Robot using Accelerometer</li> </ul>
Day 42	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Feedback control system in Arduino.</li> <li>• Feedback algorithm</li> <li>• Error control mechanism</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Applying above mentioned systems to design much more efficient and accurate robots likewise – Line Follower.</li> </ul>
Day 43	Competition, Doubts & Practical Session
Day 44	<b>EXTRA/OPTIONAL PROJECTS</b>
Day 45	Certificate Distribution Cum Farewell Ceremony

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### Number of Projects Covered in ADVANCE MODULE

### SUMMER TRAINING PROGRAM Robotics & Embedded Systems

1. Blink a LED using a switch
2. Glowing LEDs in pattern of your own choice.
3. Designing of RGB color pattern
4. Automatic light control system
5. Transistor as a touch switch
6. Transistor as a NOT Gate
7. Transistor as an amplifier
8. Daily alarm clock
9. Flood control alarm system
10. Generation of MIDI tones
11. Intelligent blind stick
12. Manual robotic car
13. Automatic line follower Robot
14. Automatic obstacle detection System
15. LDR based Darkness activation system
16. LDR based Light activation system
17. Voltage divider system
18. Pulse generation using 555
19. Automatic blinking of light
20. Automatic blowing of buzzer
21. Display digits on seven segment display
22. Automatic stop watch
23. Digital clock
24. Dc motor speed control using PWM
25. Automatic speed controlled BOT
26. Mobile switching device
27. Mobile controlled BOT
28. Digital display device
29. Automatic power control system
30. Automatic home sweeper device
31. Multiple device switching through mobile phone
32. Edge avoider BOT
33. Wall Follower BOT

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34. Obstacle avoider BOT
35. Traffic control system
36. Visitor counting application
37. Keypad operated BOT
38. Mobile phone keypad prototype
39. Password controlled application
40. Display text on LED Matrix
41. Scroll strings on LCD
42. Line follower BOT displaying the directions
43. Ultrasonic BOT
44. Radar using Ultrasonic sensor.
45. MATLAB Mathematics
46. Sensors interfacing and calibration with MATLAB
47. Controlling buzzers and LED using serial communication
48. Colour conversions and colour detections
49. Object tracking
50. Interfacing Real world with Digital world
51. LED blinking and pattern generation using MATLAB
52. LED multiplexing
53. Motor control using MATLAB
54. Interfacing MATLAB with Seven Segment Display
55. Automatic gesture controlled robot using MATLAB
56. LED Blinking using Accelerometer
57. Gesture Recognition using Accelerometer
58. Motor Control using Accelerometer
59. Design a pattern on LED matrix with MATLAB
60. Accelerometer based security system



