

# PCB & Circuit Designing

(Summer Training Program)

6 Weeks/ 45 Days

“PRESENTED BY”



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An ISO 9001 : 2008 Certified Company

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HOUSTON U.S.A.

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# SUMMER TRAINING PROGRAM

## PCB & Circuit Designing

**Course** : PCB & Circuit Designing  
**Certification** : By RoboSpecies Technologies Pvt. Ltd. Accredited by International Accreditation Organization, Houston, U.S.A.  
**Study Material** : Books & CDs Free to each participant  
**Robotics Toolkit** : Free to Each Participant

**Projects:** 60 Projects Covered in 45 Days

### Fees & Duration

1. For PCB & Circuit Designing (**ADVANCE**)

**Fees** : ₹ 9,990/- per candidate

**Duration** : 45 Days/6 Weeks

ADVANCE MODULE - PCB & Circuit Designing	
DAYS	TOPICS
Day 1	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to Robotics</li> <li>• Introduction to PCB &amp; Circuit Designing</li> <li>• Basics of hardware and software</li> <li>• New and upcoming Technologies</li> </ul>
Day 2	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to Manual Robotics</li> <li>• Motor principle explained</li> <li>• Different types manual robots and their applications</li> <li>• Controlling of motors through switches</li> <li>• Gear assembly and calculations</li> <li>• Different types of chassis design</li> <li>• Concept of robotic events</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• To make a sound connections Designing of remote control</li> <li>• Manual Robotics practical session</li> <li>• Assembling of a robotic car</li> </ul>
Day 3	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to PCB design software</li> <li>• Different tools used for PCB designing</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Hands on PCB design software</li> <li>• Making different circuits</li> </ul>
Day 4	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Different circuit on PCB design software</li> <li>• Schematic of Different circuits</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Designing different circuit</li> <li>• Checking for errors</li> </ul>

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## PCB & Circuit Designing

DAYS	TOPICS
Day 5	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Soldering Methods.</li> <li>• Safety Precautions</li> <li>• Different Methods of Soldering</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Soldering LED's on Zero PCB.</li> <li>• Checking for errors</li> </ul>
Day 6	<b>PROJECT</b>
Day 7	<b>PROJECT</b>
Day 8	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Soldering Techniques</li> <li>• How to solder different components</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• LED Design Patterns</li> <li>• Use of Flux in soldering</li> <li>• Soldering Iron Precautions</li> <li>• Solder and Solder Materials Precautions</li> <li>• Checking for errors and desoldering techniques</li> </ul>
Day 9	<p><b>Theory</b></p> <ul style="list-style-type: none"> <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>• Designing of IR Sensors</li> <li>• Testing of IR sensors</li> <li>• Detecting white and black surface with digital IR sensors</li> <li>• Monitoring analog and digital sensors</li> </ul>
Day 10	<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 11	<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>

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## PCB & Circuit Designing

DAYS	TOPICS
Day 12	Completion of Line Follower Bot, Obstacle detector BOT and Edge avoider bot
Day 13	<b>PROJECT</b>
Day 14	<b>PROJECT</b>
Day 15	Competition, Doubts and practical session
Day 16	<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>
Day 17	<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 18	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Different PCB Design Software</li> <li>• Making circuit on PCB Design Software</li> <li>• Deploying basic circuits from paper to schematic window</li> <li>• Testing the schematic for errors</li> <li>• Making Board Layout</li> <li>• Checking for errors and finalizing layout</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Designing circuit on PCB software</li> <li>• Checking for errors in circuit</li> <li>• Finalizing circuit schematic</li> </ul>

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## PCB & Circuit Designing

DAYS	TOPICS
Day 19	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Etching process</li> <li>• Safety precautions before starting the etching process</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Getting PCB ready for etching</li> <li>• Etching the PCB</li> <li>• Checking for errors</li> <li>• Cleaning the PCB</li> </ul>
Day 20	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Finalizing PCB and Studying the circuit</li> <li>• Drilling and Soldering methods of PCB</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Checking the PCB circuit</li> <li>• Drilling holes on PCB</li> <li>• Soldering the Components on PCB</li> <li>• Testing the finished PCB</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>• Arduino and Breadboard</li> <li>• Operation of Analog and Digital Signals</li> <li>• Introduction to ADC (theory)</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing electronic components with arduino.</li> <li>• Interfacing breadboard circuits and arduino</li> <li>• 8 bit and 10 bit concept</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 24	<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> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Creating the LED pattern on Bread Board</li> <li>• Color sensor on breadboard</li> </ul>
Day 25	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Know How of connecting motor driver board with ARDUINO.</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Interfacing Motor Driver with ARDUINO.</li> <li>• Controlling motor (Direction of rotation, ON/OFF).</li> <li>• Speed Control of Motors using PWM</li> </ul>

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DAYS	TOPICS
Day 26	<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 27	<p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Making of Line Follower BOT</li> <li>• Wall Follower BOT using ATMEGA 328</li> <li>• Automatic obstacle avoider BOT</li> </ul>
Day 28	<b>PROJECT</b>
Day 29	Doubts, testing and competition session
Day 30	<b>PROJECT</b>
Day 31	<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>• Testing of DTMF</li> <li>• Integrating DTMF with Basic Shield</li> </ul>
Day 32	<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 33	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Advanced circuit on PCB design software</li> <li>• Testing the schematic for errors</li> <li>• Making Board Layout</li> <li>• Checking for errors and finalizing layout</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Designing Advanced circuit on PCB software</li> <li>• Checking for errors in circuit</li> <li>• Finalizing circuit schematic</li> </ul>
Day 34	<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> </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 LED</li> </ul>

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Day 35	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Introduction to analog Circuits</li> <li>• Introduction to breadboard</li> <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>• LDR based Automatic light control</li> <li>• Transistor as an amplifier</li> <li>• Transistor as a NOT gate</li> <li>• Transistor as a Touch Switch</li> <li>• Controlling brightness of LED using potentiometer</li> <li>• Interfacing 555IC for LED blink</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>• 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 39	<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> <li>• 2D-3D Plots</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>• Subplotting the Matrix functions, Editing Plots</li> </ul>
Day 40	<p><b>Theory</b></p> <ul style="list-style-type: none"> <li>• Integrating MATLAB with Microcontroller</li> <li>• 2D-3D Plots</li> <li>• Image Processing</li> <li>• Basics of Image Processing</li> </ul> <p><b>Practical</b></p> <ul style="list-style-type: none"> <li>• Serial and Parallel data interfacing</li> <li>• Transfer of Bit by Bit data</li> <li>• Controlling actuators using MATLAB</li> <li>• Reading and Writing Images</li> </ul>

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DAYS	TOPICS
Day 41	<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 42	<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>• interfacing with ARDUINO.</li><li>• Reading values of Ultrasonic sensor at several points in SERIAL MONITOR</li></ul>
Day 43	<b>PROJECT</b>
Day 44	Doubts and competition session
Day 45	Certificate Distribution Cum Farewell Ceremony

### Number of Projects Covered in ADVANCE MODULE

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



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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. LED Control using Switch
21. DC motor speed control using PWM
22. Automatic speed controlled BOT
23. Mobile switching device
24. Automatic home sweeper device
25. Line Follower BOT
26. Edge avoider BOT
27. Wall Follower BOT
28. Obstacle avoider BOT
29. Intelligent Line Follower BOT
30. Traffic control system
31. PCB Circuit designing
32. Remote Control Designing
33. PCB Fabrication
34. Soldering Techniques
35. Safety Precautions
36. Eagle CAD Circuit Designing
37. Error Checking & Rectification Methods
38. Advance PCB Designing
39. Arduino and Breadboard
40. Arduino Circuit Designing
41. Visitor counting application
42. Display digits on seven segment display
43. Keypad operated BOT
44. Mobile phone keypad prototype
45. Password controlled application
46. Display text on LED Matrix
47. Radar using Ultrasonic sensor.
48. Ultrasonic BOT
49. Mobile controlled BOT
50. Automatic power control system
51. Automatic home sweeper device

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52. Multiple device switching through mobile phone
53. Line Follower BOT displaying the directions
54. Multiple device switching through mobile phone
55. Color detection in still image
56. Edge detection in still
57. Cam-Shots
58. Serial Communication in MATLAB
59. MATLAB interfaced manual BOT
60. Controlling power through MATLAB

### **Advance Module Kit Content**

- RoboSpecies Chassis (1)
- BO Motors (2)
- Wheels (2)
- Caster Wheel (1)
- Screw packet (1)
- Screw driver (1)
- Remote Controller (1)
- Electronica Kit (1)
- Arduino Uno
- Basic Arduino Shield(1)
- IR Sensor Board (2)
- Motor Shield(1)
- DTMF Board (1)
- DTMF Jack(1)
- LCD Shield (1)
- Seven Segment Display Shield (1)
- Ultrasonic (1)
- Keypad Matrix
- Robotics Made Easy- Robotic eBook CD(1)

