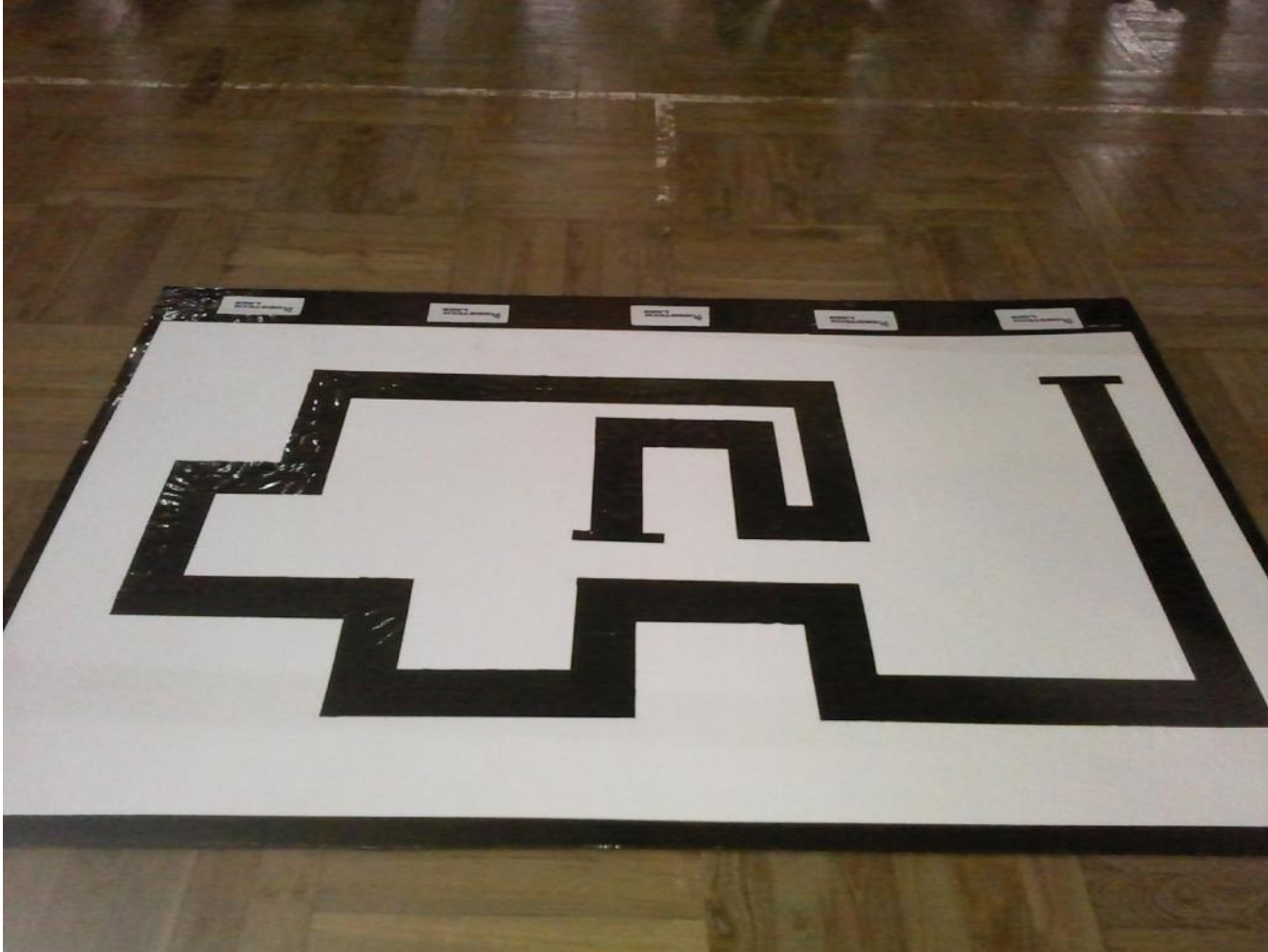# Autonomous Robotics

Practicals Covered:

- Line Follower
- Edge Detector
- Wall Follower
- Obstacle Avoider
- Mobile Operated Robot

ROBOTECH LABS

PVT.LTD.

The Workshop is designed targeting students of all branches, the workshop is beneficial for both beginner or intermediate Robocist .

This workshop aims at students wanting to introduce themselves to the field of robotics & AI and how it is implemented in real life, This workshop teaches you the fundamentals of designing and building autonomous robots by integration with a microcontroller. It also focuses on conceptualization and designing of complex systems and will help clear concepts related to embedded systems, artificial intelligence and automation.

The workshop would taken up by the people in the industry having immense experience at the international level in the field of Robotics and AI.

Proper Hands – On Session would be conducted for the students so that they can grasp practical knowledge by using Special Kits designed by our team which has an immense exposure and expertise in the fields of Robotics and AI at the International Level.

The Multipurpose Kit can be used for the following tasks:-

- 2 wheel self balancing robot
- Sumo Wrestling Robot
- Line follower robot
- Obstacle chaser robot
- Wall Follower
- Robo Soccer
- Obstacle avoider robot
- Object follower robot
- Photophobic robot
- Phototropic robot
- Wall Follower

Topics to be covered

SESSION 1: Introduction to Robotics – 45 min

1. Brief history
2. Existing robotics applications and types of robots
3. Robotics as a field and its constituents
    a) Control theory (Kinematic and dynamic)
    b) Cybernetics
    c) AI
    d) Sensors
    e) Overview of the events organized in Colleges like IITD, NSIT.

In this session basic idea of robots and robotics is made clear.
Participants are introduced to process of building machine/robots .

SESSION2 : Basics Of Robotics - 1 Hr

LOCOMOTION

- Wheeled
- Legged
- Climbing
- Flying
- Floating

Details on various modes of locomotion like wheeled, tracked, legged, flying etc is given to participants. More focus is given to wheeled and tracked robots, as they are most common and preferred. In these

concepts of vehicle, dynamics are made clear like effect of center of mass, payload on robot etc.

TYRES

- Choosing tyres specific to application
- Type of grips
- Deciding the contact area of the tyres
- Choosing the material for the tyres

POWER SUPPLIES
- Lead-acid batteries
- Ni-Cd
- Ni-Mh
- Li-ion

TRANSMISSION SYSTEMS

- Gear
- Belt Pulley
- Worm gears
- Chain Sprocket
- Rack and Pinion
- Screw and Nut Arrangement

Various kinds of transmission systems, which can be used in building a basic robot, are introduced. After general introduction, the major elements of transmission systems like gears, belt and pulleys, chain sprockets etc are discussed in detail. Comparisons of above said transmission systems are performed helping in deciding the most suitable transmission system.

GOOD ENGINEERING PRACTICES

- Bearing
- Bushing
- Coupling
- Linkages

In this session the participants are told about the importance of applying good engineering practices while making a robust machine. Concepts related to bearing, bushings etc are discussed. The practical issues while implementing these are talked about.

BASIC ELECTRICAL CONTROL SYSTEM

- Various types of switches available
- DPDT Switches
- Limit Switches
- Relays

The final controlling of a machine after building it, is taught in this section. The various kinds of switches, relays etc are shown and taught to the participants. How to make the connections for a manual control is made clear with the help of hands on session. Use of RC control is also discussed in brief.

General idea of PCB's and Related Softwares.

SESSION 3 : Mechanical Working –1 Hr

1. Differential drive system
2. Differential drive kinematics
3. Differential drive dynamics
4. Dead reckoning

ACTUATORS

1. Stepper motors
2. Servo motors

3. Hydraulic arms
4. Control of actuators
5. PWM
6. H-bridge
7. Control of servos
8. Reduction in speed of motors
9. Increase in the torque of motors
10.   Selection of motors as per the application

Everything would be taught in detail about the actuators , their working and real life implementation.
After the above lecture the students will be well acquainted with the concepts of controlled actuation with various kinds of actuators mentioned above and will also understand the basics of various types of motor drivers.

MOTOR DRIVER
- Relays-Transistor Motor Driver
- Motor Driving using Darlington Transistors (ULN Devices)
- H-Bridge Motor Driver
- Detailed working of L293D

The whole concept of mechanics would be taught in detail, thereby giving some practical examples.
The above lecture aims at explaining the dynamics and kinematics of differential drive system to the students with mathematical equations and there applications , Also live demonstration on a simulation platform

SESSION 4: Introduction to Microcontrollers −2 Hr

- Architecture
- Functioning

- Overview of available microcontrollers
- Features and capabilities will be studied in depth.
- Functioning and use of RS-232

In this session , students would be taught about the microcontrollers in details and how to use a development or the microcontroller with the system.

The above lecture will enable students to understand the microcontroller functioning and program it.

SESSION 5: Basic PROGRAMMING –2 Hr

- Micro Controller Programming
- In System Programming
- Programming the chip
- How to program a microcontroller to generate PWM
- LCD Interfacing
- Controlling H-bridge
- Developing algorithms for Intelligent ROBOTS and writing programs for the same.

The above lecture will build upon the last one and get students acquainted with programming API and students will also be taught to run their codes on emulator for testing.

SESSION 6: Concept of Mobile Robotics—1 Hr

- Concept of DTMF
- DTMF Decoder
- Interfacing DTMF decoder with Atmega 8
- Robot controlling by mobile

SESSION 7: Introduction to Sensors - 1Hr

1. Line detection sensors
- IR,LDRS and other important sensors
- Functioning of IR sensors
- Configuration of IR sensors

2. **LDRs**
- Functioning of LDRS
- Configuration of LDRs

3. Range detection sensors
- TSOPS
- Tactile sensors

HANDS - ON(6 hrs)

ASSEMBLING THE ADVANCED OBSTACLE AVOIDER

- Basic principle of moving
- Assembling of the Bot
- Assembling of the sensors
- Assembling the whole system to the Motor Driver

- Interfacing the microcontroller with the Motor Driver & the sensor IC.

ASSEMBLING THE ADVANCED LINE FOLLOWER

- Basic Principle of Color Sensing
- Basic Principle of a Line Follower
- Assembling of the line follower
- Assembling of the sensors
- Assembling the whole system to the Motor Driver
- Interfacing the microcontroller with the Motor Driver & the sensor IC.

ASSEMBLING THE WALL FOLLOWER

- Basic Principle of Wall Sensing
- Basic Principle of a Wall Follower
- Assembling of the wall follower
- Assembling of the sensors
- Assembling the whole system of the Motor Driver & MC.

ASSEMBLING THE Mobile Controlled Robot

- Basic principle of moving
- Assembling of the Bot
- Assembling of DTMF Board
- Assembling the whole system to the Motor Driver
- Interfacing the microcontroller with the Motor Driver & the sensor IC.

SOME APPLICATIONS OF MOBILE ROBOTICS

- Home Automation
- Security Automation

- Office Automation

And much more…………..

DURATION

We conduct workshops on two consecutive days. Each day has an eight hours session (in total 16 hours). This is properly divided into theory and hands-on sessions.

Also some time is exclusively left Interactive Session for Problem Discussion and discussing new ideas etc

CHARGES

The charges for the workshop are 1400 /- per person inclusive of all taxes and training material.

The Charges includes:

- Training fee of the 2 day workshop
- Handouts and training material
- Information CD
- Participation certificate
- Additionally, a detailed manual will also be provided to each participant in the form of CD.

Free Complimentary Kit to a team of four students.

The kit Includes:

The Controller board:

Brain of the ROBOT

- 4 channels of motor control(**L293NE**), capable of driving 2 dc motors or 1 stepper motor at a time
- 8 digital input channels for sensor interfacing
- ADC – with 8 inputs for Transducer interfacing
- Onboard Port Connector for In System Programming
- USB Connectivity for PC /Laptop Interfacing
- Multipurpose Breadboard for future use.

- ## DTMF MODULE

Sensors :

- Two IR Based sensors

Chassis:

- Laser cut, Aluminum Chassis

Others :
- 2 geared DC motors 500 Rpm
- 2 Nylon Wheels and one castor wheel
- Other supporting hardware eg. screws, nuts and washers .

Power Source:

High power durable battery.

CD

- CD containing all required documents for building and using this robot kit

CERTIFICATION POLICY

Certified by RCSA Canada Certified Robotech Labs Pvt Ltd and ABV-IIIT Gwalior.