

EV3 ROBOTICS



**TEACHER:
CERTIFIED
TRAINER**

**DURATION:
16 CLASSES(x4 LEVELS)
(1 HOUR PER CLASS)**

**MODE:
OFFLINE**

This curriculum combines **mechanical design and programming** using LEGO Hi-Tech robotic kits. Students build motorized, programmable robotic models and use various sensors. Each session involves assembling and coding a working model, enhancing creativity and problem-solving skills. The programming software is designed to be user-friendly for children.

Course Levels

1. Junior
2. Beginner
3. Intermediate
4. Advanced

COURSE CURRICULUM

- Introduction to Robotic Kit, Components, and GUI-based Programming Software:
 - Beams, Angular Beams, Axles, Gears, Bushes, Motors, Controller, and Sensors

(Ultrasonic, Touch, Color, etc.).

- Learning Input-Output Devices and Port Mapping
- Motor Control Techniques
 - Adjust speed, direction, and movement patterns.
- Motor Movements in Different Directions
 - Implement axis and pivot turns.
- Port View and Measurements
 - Monitor sensor values and motor states.
- Maze Solving Challenge
 - Develop problem-solving skills through pathfinding logic.
- Introduction to Ultrasonic Sensor
 - Use for obstacle detection and distance measurement.
- Comparison Operators and Conditional Logic
- Programming with Loops and Sequences
- Touch Sensor and Its Modes
 - Explore tactile input and interaction.
- Boolean Data Types in Robotics Programming
- Color Sensor and Its Modes
 - Detect colors and implement conditional responses.

Programming Blocks:

1. Action Blocks

These blocks are used to control motors and the robot's actions.

- Move Steering Block: Controls both motors to steer the robot in different directions.
- Move Tank Block: Controls the left and right motors independently, allowing for more precise movement.
- Large Motor Block: Activates a single large motor to rotate a specific amount.
- Medium Motor Block: Controls smaller motors for secondary movements like arms or attachments.
- Display Block: Displays text, numbers, or images on the EV3 brick's screen.
- Sound Block: Plays sounds or beeps through the EV3 brick's speaker.
- Light Block: Adjusts the light on the EV3 brick to indicate status.

2. Sensor Blocks

These blocks allow the robot to take input from various sensors.

- Touch Sensor Block: Detects if the touch sensor is pressed, released, or held.
- Ultrasonic Sensor Block: Measures the distance between the robot and an object.
- Color Sensor Block: Detects colors or measures the intensity of light .
- Gyro Sensor Block: Detects changes in the robot's orientation or measures rotational angles.
- Timer Block: Controls or measures time within a sequence.

3. Flow Control Blocks

These blocks control the logic and flow of the program.

- **Start Block:** Marks the beginning of a program.
- **Wait Block:** Pauses the program until a certain condition is met (e.g., until a button is pressed or a sensor value is reached).
- **Loop Block:** Repeats a sequence of actions based on a condition (e.g., until a sensor detects an obstacle).
- **Switch Block:** Works like an if-else statement to choose between two actions based on a condition.
- **Loop Interrupt Block:** Stops a loop or breaks it when a specific condition is triggered.

4. Data Operations Blocks

These blocks allow you to manipulate data during the program.

- **Math Block:** Performs arithmetic operations like addition, subtraction, multiplication, or division.
- **Compare Block:** Compares two values (e.g., checking if a sensor reading is greater than a threshold).
- **Logic Block:** Performs Boolean operations (AND, OR, NOT).
- **Variable Block:** Stores and retrieves values during the program.
- **Random Block:** Generates random numbers, often used for games or unpredictable behavior.

5. My Blocks Without and With Parameters

- **Creating My Blocks (No Parameters):**
 - Building reusable code modules for repeated actions like moving forward a fixed distance.
 - Simplifying complex programs by organizing code into smaller, easy-to-understand blocks.
- **Creating My Blocks with Parameters:**
 - Adding input parameters to make My Blocks more flexible (e.g., speed, distance, or direction).
 - Example: A My Block for movement that accepts speed and angle as parameters.
 - Using variables within My Blocks to manage inputs dynamically.

6. Advanced Blocks

These are specialized blocks for more complex operations.

- **Bluetooth Block:** Enables communication between two EV3 bricks via Bluetooth.
- **File Access Block:** Reads or writes to files on the EV3 brick.
- **Messaging Block:** Sends messages between different programs or bricks.

How to Use These Blocks in a Program

1. **Drag and Drop:** Blocks are placed on a sequence line in the EV3 software, determining the program's flow.
2. **Parameters:** Most blocks have adjustable parameters (e.g., motor speed, sensor

thresholds) that can be set via dropdowns or sliders.

3. Wiring Connections: Some blocks need data wires (lines between them) to transfer information, like passing a sensor reading into a condition block.

Class Structure

1. Introduction to Mechanical Components and Controller
 - Learn about motors, sensors, and the use of a controller.
2. Supervised Self-Assembly of Robotic Models
 - Build working robotic models with guidance from certified trainers.
3. Introduction to Programming Concepts
 - Use graphical programming language appropriate for each level.
4. Coding the Robotic Models
 - Write logic to control motor speed, direction, and sensor input.
5. CS-STEM Concepts
 - Connect coding and engineering principles with real-world applications.
6. Practical Experiments and Challenges
 - Hands-on challenges and observations to solidify learning, including:
 - Maze Solving Projects
 - Obstacle Detection Tasks using the Ultrasonic Sensor
 - Color-Based Sorting Models.
 - Touch-Triggered Responses in interactive robots