



# **Robotics Intermediate level**

## **Curriculum**

### **Tabel Of Content**

**Module 1: Robotics System Architecture**

**Module 2: Advanced Motor Control**

**Module 3: Sensor Integration & Fusion**

**Module 4: Embedded Programming for Robotics**

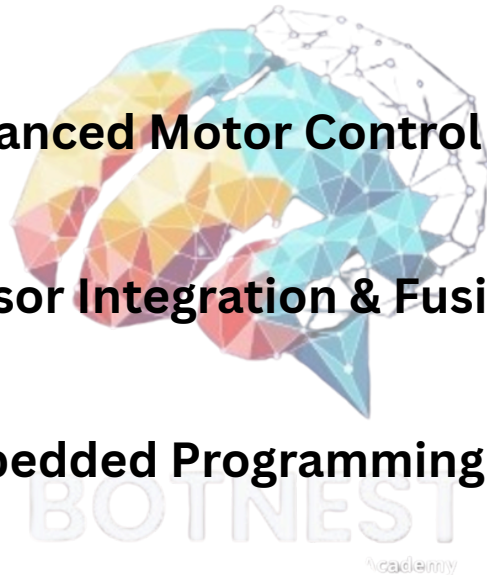
**Module 5: Autonomous Navigation Logic**

**Module 6: Human–Robot Interaction**

**Module 7: Displays & Feedback Systems**

**Module 8: Automation & Control Logic**

**Module 9: Mini Projects (Intermediate Level)**



## **Module 1: Robotics System Architecture**

- Review of beginner concepts
- Robot subsystems (mechanical, electrical, control)
- Control flow in robotic systems
- Real-world robot design examples

✓ **Activity: Robot block-diagram design**

## **Module 2: Advanced Motor Control**

- Motor speed control using PWM
- Smooth acceleration & braking
- Turning algorithms
- Power management basics

✓ **Hands-on: Speed-controlled robot**

## **Module 3: Sensor Integration & Fusion**

- Using multiple sensors together
- Ultrasonic + IR combination
- Sensor accuracy & noise handling
- Decision logic using sensor data

✓ **Hands-on: Smart obstacle avoidance robot**

## **Module 4: Embedded Programming for Robotics**

- **Modular coding**
- **Functions & libraries**
- **Timing and delays vs millis()**
- **Debugging strategies**

 **Hands-on: Optimized robot control code**

## **Module 5: Autonomous Navigation Logic**

- **Rule-based navigation**
- **Path decision making**
- **Line follower optimization**
- **Basic maze-solving logic**

 **Hands-on: Advanced line follower robot**

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## **Module 6: Human–Robot Interaction**

- **Bluetooth / mobile control**
- **Joystick control**
- **Manual vs autonomous switching**
- **Safety handling**

 **Hands-on: Mobile-controlled robot**

## **Module 7: Displays & Feedback Systems**

- **LCD / OLED display usage**
- **Status indicators**
- **Debug information display**
- **User interaction basics**

 **Hands-on: Robot status display system**

## **Module 8: Automation & Control Logic**

- **Event-based robot behavior**
- **Time-based actions**
- **Emergency stop logic**
- **Fail-safe mechanisms**

 **Hands-on: Intelligent robot behavior system**

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## **Module 9: Mini Projects (Intermediate Level)**

**Students build real-world robotics applications such as:**

- **Advanced Obstacle Avoiding Robot**
- **Maze Solving Robot**
- **Smart Line Follower Robot**
- **Bluetooth-Controlled Robot**
- **Automated Delivery Robot Prototype**

## Core Skills Developed

- Robotics system design
- Advanced motor & sensor control
- Structured embedded programming
- Logical decision making
- Debugging & optimization
- Team collaboration

## Learning Outcomes

By the end of the program, students will:

- Design semi-autonomous robots
- Integrate multiple sensors effectively
- Implement intelligent navigation logic
- Control robots wirelessly
- Prepare for robotics competitions

## Certification

- BotNest IoT Beginner Program Certificate
- Project-based assessment