

Workshop Plan: IoT & Robotics

Satpuḍa School

This document provides two distinct, detailed 10-day workshop plans for Grade 8 and Grade 9. Both curricula are designed for absolute beginners, following a simple, step-by-step structure. Each day focuses on a single core concept, which all project groups will then apply to their unique projects.

Grade 8: Workshop Plan

Goal: To build a strong foundation in the core building blocks of IoT and Robotics (**Controller, Sensors, Actuators, Connectivity**) through hands-on application.

Phase 1: Spark & Foundation (Days 1-4)

Day 1: "The Spark" - Introduction & Demo Day

- **Today's Goal:** To generate excitement and curiosity about IoT and Robotics.
- **Introduction & Demo (30 min):**
 - **What, Why, How:** A simple and exciting introduction to what IoT and Robotics are.
 - **Live Demo:** Showcase pre-built projects (like a gesture-controlled car, smart light) to show students the amazing things they can build.
 - **The Promise:** Announce that over the next 9 days, they will be building similar projects themselves.
- **Planning & Team Building (30 min):**
 - **The Journey:** Briefly explain the 10-day plan.
 - **Group Formation:** Form 6 project groups.
 - **Project Teaser:** Give a sneak peek of the projects each group might work on.

Day 2: "Hello, World!" - Your First Step into IoT

- **Today's Goal:** Understand that a controller is a "brain" that can be programmed.
- **Common Lesson (20 min):**
 - **Theory:** Introduction to the **human body analogy**: the **Controller (ESP8266)** is the **Brain** 🧠, **Sensors** are our **Senses** 👁️, and **Actuators** are our **Muscles** 💪.
 - **Hardware Intro:** Introduction to the ESP32, Breadboard, and Jumper Wires.
- **Group Activity (40 min):**
 - **Task:** The "Blink" activity. Students will upload pre-written code to make the ESP32's built-in LED light blink.
 - **Learning:** They will change the `delay()` value in the code to see the blink speed change, learning the direct link between code and hardware.

Day 3: "Giving Senses" - Understanding Sensors

- **Today's Goal:** Learn that sensors are input devices that collect information.

- **Common Lesson (20 min):**
 - **Theory:** How do smart devices "know" things? Through sensors! We'll introduce project-specific sensors: **Accelerometer**, **PIR Sensor**, and **Keypad**.
 - **Tool Intro:** Introduction to the Arduino IDE's **Serial Monitor**.
- **Group Activity (40 min):**
 - **Task:** Connect a simple Push Button and use provided code to print "Button Pressed!" on the Serial Monitor.
 - **Learning:** This solidifies the concept of **Input**.

Day 4: "Taking Action" - Controlling Actuators

- **Today's Goal:** Learn that actuators are output devices that perform physical actions.
- **Common Lesson (20 min):**
 - **Theory:** How do robots move? Using actuators! We'll introduce project actuators: **DC Motor**, **Servo Motor**, and **Buzzer**.
- **Group Activity (40 min):**
 - **Task:** Connect a Servo Motor and use provided code to make it rotate to specific angles.
 - **Learning:** They will modify the angle in the code to see the effect, solidifying the concept of **Output**.

Phase 2: Project Development (Days 5-10)

Day 5: "Project Kickoff" - Assembly & Sensor Test

- **Today's Goal:** Assemble the project and test its main sensor.
- **Group Activity (60 min):**
 1. **Assign Projects:** Officially assign one project to each group and provide the kits.
 2. **Assembly:** Groups will assemble the main physical structure of their project.
 3. **Sensor Test:** Each group will connect their project's main sensor and view its live data on the Serial Monitor (e.g., Gesture Robot group tests the Accelerometer).

Day 6: "Testing the Muscles" - Actuator Integration

- **Today's Goal:** Test the project's primary actuator independently.
- **Group Activity (60 min):** Each group will connect their main actuator and run a simple test code.
 - **Gesture Robot / Surveillance Car:** Make motors run forward and backward.
 - **LoRa System:** Make an LED on the receiver board light up.
 - **Password Door Lock:** Make the servo lock and unlock.

Day 7: "The Brain-Body Connection" - Logic in Action

- **Today's Goal:** Understand the if...else logic that connects sensor input to actuator output.
- **Common Lesson (20 min):** Explain **IF-THIS-THEN-THAT** logic with real-world examples.
- **Group Activity (40 min):** Students receive code that links their sensor to their actuator

and identify the if statement that makes the decision (e.g., if (motion_detected), turn on LED).

Day 8: "Adding Superpowers" - Wireless Communication

- **Today's Goal:** Use Wi-Fi or other radio communication to add a smart feature.
- **Group Activity (60 min):** Groups will integrate their project's wireless feature.
 - **Surveillance Car:** Stream live video to a web browser.
 - **Spy Cam:** Send a notification to Telegram.
 - **Smart Alarm Clock:** Sync time from the internet.
 - **LoRa System:** Test sending commands over a long distance.

Day 9: "The Final Polish" - Debugging and Practice

- **Today's Goal:** Fix problems (debug) and prepare for the final presentation.
- **Common Lesson (15 min):** The top 3 common problems: **Loose Wires, Wrong Pin Connections, and Power Issues.**
- **Group Activity (45 min):** All groups will test their projects, fix any bugs with the instructor's help, and practice explaining how their project works.

Day 10: "Showtime!" - Project Showcase

- **Activity (60 min):** The Grand Finale! Each group will present their project, give a live demo, and share what they learned. This is followed by a Q&A and certificate distribution.

Grade 9: Workshop Plan (Capstone & AI-Based Projects)

Goal: To build a strong foundation in IoT/Robotics by applying basic concepts step-by-step to build a complex and impressive capstone project.

Phase 1: Spark & Foundation (Days 1-4)

Day 1: "The Spark" - Introduction & Demo Day

- **Today's Goal:** To generate excitement and curiosity about advanced robotics.
- **Introduction & Demo (30 min):**
 - **What, Why, How:** A simple and exciting introduction to what IoT and Robotics are.
 - **Live Demo:** Showcase pre-built advanced projects (like a robotic arm, a following robot) to show students what's possible.
 - **The Promise:** Announce that over the next 9 days, they will be building similar projects themselves.
- **Planning & Team Building (30 min):**
 - **The Journey:** Briefly explain the 10-day plan.
 - **Group Formation:** Form 6 project groups.
 - **Project Teaser:** Give a sneak peek of the advanced projects.

Day 2: "Hello, World!" - Your First Step into IoT

- **Today's Goal:** Understand that a controller is a "brain" that can be programmed.
- **Common Lesson (20 min):**
 - **Theory:** Same as Grade 8 (Human Body Analogy).
 - **Hardware Intro:** Introduce ESP32, Breadboard, and Jumper Wires.
- **Group Activity (40 min):**
 - **Task:** The "Blink" activity. Upload pre-written code to make the ESP32's LED blink.
 - **Learning:** Change the delay() value to understand the code-hardware link.

Day 3: "Giving Senses" - Understanding Sensors

- **Today's Goal:** Learn that sensors are input devices that collect information.
- **Common Lesson (20 min):**
 - **Theory:** Same as Grade 8. Use examples from their advanced projects: **IMU** and **Ultrasonic Sensors**.
 - **Tool Intro:** Introduction to the Arduino IDE's **Serial Monitor**.
- **Group Activity (40 min):**
 - **Task:** Connect a simple Push Button to see "Button Pressed!" on the Serial Monitor.
 - **Learning:** This solidifies the core concept of **Input**.

Day 4: "Taking Action" - Controlling Actuators

- **Today's Goal:** Learn that actuators are output devices that perform physical actions.
- **Common Lesson (20 min):**
 - **Theory:** Same as Grade 8. Introduce their project actuators: **High-Torque Servos** and **Brushless Motors**.
- **Group Activity (40 min):**
 - **Task:** Connect a single Servo Motor and make it rotate.
 - **Learning:** This solidifies the core concept of **Output**.

Phase 2: Capstone Project Development (Days 5-10)

Day 5: "Project Kickoff" - Assembly & Key Sensor Test

- **Today's Goal:** Assemble the complex project and test its main sensor.
- **Group Activity (60 min):**
 1. **Assign Projects:** Officially assign one capstone project to each group.
 2. **Assembly:** Groups will perform the complex assembly for their projects.
 3. **Sensor Test:** Each group connects just **one** of their main sensors and sees its data (e.g., Human Follower group tests the Ultrasonic sensor).

Day 6: "Coordinated Action" - Controlling Two Actuators

- **Today's Goal:** Make two actuators work together.
- **Group Activity (60 min):** Each group will control just **two** of their project's actuators.
 - **Dancing Robot:** Make two arm servos move together.
 - **Robotic Arm:** Control the base and first arm joint.

- **Human Follower:** Make both wheels spin forward together.

Day 7: "A Smarter Decision" - Simple Logic

- **Today's Goal:** Use a simple if statement to make a decision.
- **Group Activity (60 min):** Students receive code that uses a simple if statement.
 - **Human Follower:** if (distance < 100), stop motors.
 - **AI Parking:** if (slot1_empty), turn on a green LED.
 - **Robotic Arm:** if (button_pressed), move to a saved position.

Day 8: "Displaying Data Online" - Your First Web Server

- **Today's Goal:** Create a simple webpage on the ESP32 to show information.
- **Group Activity (60 min):** Each group will create a webpage that shows the live data from the sensor they connected on Day 5 (e.g., "Distance: 50 cm").

Day 9: "Putting It All Together" - System Integration & Debugging

- **Today's Goal:** Combine all parts into a basic working system and fix problems.
- **Group Activity (60 min):** All groups will load the first complete version of their project code and work to get the basic function working, with the instructor's help.

Day 10: "Capstone Showcase" - Final Presentation

- **Activity (60 min):** The Capstone Showcase. Each group will present their advanced project, give a live demo, and explain what they learned about building a complex system from simple steps.