Project List: IoT & Robotics 2nd to 5th

This list provides a variety of fun, hands-on projects for young learners (Grades 2-5) to explore the fundamentals of electronics, sensors, and mechanics. Each project is designed to be built without any programming and includes an estimated cost in Indian Rupees (₹) to help with planning.

A. Light-Based Projects

1. The Automatic Forest Hut Lamp

- **What it Does:** A small lamp, housed within a creative model, that automatically switches ON when the room gets dark, demonstrating a simple smart-lighting system.
- **Learning Concept:** Discover how light sensors (LDRs) can detect changes in ambient light levels and act as an automatic trigger for an electronic circuit.
- **Key Components:** LDR (Light Dependent Resistor), Transistor (as a switch), LED, Resistor, Battery, Breadboard/Cardboard base.
- **Detailed Creative Idea:** Don't just build a circuit; create an entire miniature world. Have the children construct a tiny model of a forest hut or a fairy house out of cardboard, twigs, and leaves. The LED goes inside, casting a warm glow through little windows. Tell a story about how "the forest creatures need a light to guide them home when the sun sets." The LDR can be cleverly disguised as a small, mossy rock or a mushroom outside the hut that "senses the evening darkness" and magically turns on the light for its inhabitants.
- **Cost Estimation (Approximate):**
    - Basic Electronics Kit (LDR, Transistor, LEDs, Resistors): ₹200
    - Prototyping Kit (Mini Breadboard, 9V Battery, Connector, Jumper Wires): ₹200
    - Craft Supplies (Cardboard, hot glue sticks, paint, decorative items): ₹350
    - **Total Estimated Project Cost: ₹750**

2. The Roaring Dragon's Treasure Alarm

- **What it Does:** A loud buzzer sounds a piercing alarm whenever a shadow is cast over its light sensor, guarding a designated object.
- **Key Components:** LDR, Transistor, Buzzer, Battery.
- **Detailed Creative Idea:** Every treasure needs a guardian. Start by creating a small, ornate "treasure chest" from a cardboard box, decorated with gold paint, glitter, and craft gems. The simple circuit is hidden inside. The LDR sensor is

placed prominently on the lid, disguised as a large, "cursed" jewel. The story is that if anyone's shadow dares to fall upon the gem, the "baby dragon" hiding inside (the buzzer) will let out a mighty roar to scare away thieves and protect the treasure within.

- **Cost Estimation (Approximate):**
  - Sensor & Sound Kit (LDR, Transistor, Buzzer, LEDs): ₹230
  - Power Kit (9V Battery, Connector, Wires, Breadboard): ₹200
  - Treasure Chest Kit (Cardboard box, paint, craft gems, glue, glitter): ₹300
  - **Total Estimated Project Cost: ₹730**

3. The Secret Agent Laser Maze

- **What it Does:** An alarm is triggered the instant a focused beam of light is broken, creating a classic spy-movie security system.
- **Your Spy Gadgets:** Laser Diode Module, LDR, Buzzer, Battery.
- **Detailed Creative Idea:** Transform a simple doorway or hallway into a high-tech challenge. The goal is to retrieve a "stolen artifact" (like a favorite toy) from the other side. You can use multiple lasers and LDRs to create a more complex web of invisible traps. For added visual effect, you can run red yarn along the path of the laser beams so players can see the challenge they need to navigate through, just like in the movies.
- **Cost Estimation (Approximate):**
  - Laser Module: ₹100
  - LDR & Buzzer Kit: ₹150
  - Power Kit (9V Battery x 2, Connectors, Wires): ₹200
  - Mounting Supplies (Clamps, tape, cardboard stands): ₹250
  - **Total Estimated Project Cost: ₹700**

4. The Light-Chasing Beetle Bot

- **What it Does:** A simple two-wheeled robot that autonomously moves towards the brightest light source in its vicinity, mimicking phototaxis.
- **Key Components:** 2 LDRs, 2 Transistors, 2 DC Motors with Wheels, Battery, Cardboard for chassis.
- **Detailed Creative Idea:** The robot's body can be made from a plastic bottle cap or a small box. Decorate it to look like a ladybug or a futuristic beetle with pipe cleaner legs and googly eyes. The two LDRs act as its "compound eyes." By shielding the LDRs slightly from each other, the robot will turn towards whichever "eye" sees more light. The kids can then guide their beetle through a dark "forest"

(a path drawn on a chart paper with obstacles) using only a flashlight as a lure.

- **Cost Estimation (Approximate):**
  - Bot Chassis Kit (2 Motors, 2 Wheels, Caster Wheel, Chassis Base): ₹400
  - Electronics Kit (LDRs, Transistors, Wires, Switch): ₹200
  - Power Kit (Battery Holder, 4xAA Batteries): ₹120
  - Decoration Supplies (Googly eyes, pipe cleaners, paint, glue): ₹130
  - **Total Estimated Project Cost: ₹850**

5. The Sunflower Power-Up

- **What it Does:** A fan, designed as a flower, starts spinning when a bright light source like sunlight or a strong torch shines on its solar panel.
- **Key Components:** Small Solar Panel, DC Motor, Fan Blade.
- **Detailed Creative Idea:** This project beautifully demonstrates the concept of solar energy. Build the fan into a large, colorful sunflower made from craft paper, with the solar panel serving as the dark center of the flower. The story is that when the sun "kisses" the flower, it soaks up the energy and gets so happy that it spins its "magic leaves" (the fan) to spread a cool breeze and share its joy.
- **Cost Estimation (Approximate):**
  - Solar Panel (5V): ₹200
  - DC Motor and Fan Blade: ₹100
  - Craft Supplies (Chart paper, cardboard, scissors, glue, sketch pens): ₹300
  - Mounting Base and Wires: ₹110
  - **Total Estimated Project Cost: ₹710**

B. Sound-Activated Projects

6. The Magical Wishing Star

- **What it Does:** An LED lights up in response to a sharp, loud sound, like a clap.
- **Key Components:** Sound Sensor Module, Transistor/Relay, LED, Battery.
- **Detailed Creative Idea:** Create a large, shimmering star shape from yellow cardboard, covering it in glitter. The LED is placed in the center, waiting to be activated. The story is that it's a "wishing star," and to make a wish come true, you must announce it with a clap of your hands. The clap provides the sound energy to make the star glow, "hearing" your wish and sending it to the cosmos.
- **Cost Estimation (Approximate):**
  - Sound Sensor Module: ₹150

    - Electronics Kit (Transistor, LEDs, Resistors): ₹100
    - Power Kit (9V Battery, Connector, Breadboard, Wires): ₹200
    - Craft Supplies (Thick cardboard, glitter, glue, scissors): ₹250
    - **Total Estimated Project Cost: ₹700**

7. The Grumpy Volcano

- **What it Does:** When it detects a loud noise, a motor inside a model volcano vibrates, and a red LED at the top glows ominously.
- **Key Components:** Sound Sensor Module, Vibrating Motor, Red LED, Battery.
- **Detailed Creative Idea:** Build a small volcano model using a plastic cup and craft paper, painting it with dark colors and red "lava" streaks. The circuit is hidden inside its base. Tell the kids that the volcano is dormant and sleeping, but loud noises disturb its slumber and make it "grumpy." When they shout or clap loudly, the volcano awakens, rumbling angrily (vibrating) and glowing with "hot lava" (the red LED) from its crater.
- **Cost Estimation (Approximate):**
    - Sound Sensor Module: ₹100
    - Vibrating Motor: ₹50
    - Power & LED Kit (Battery, Connector, Red LEDs, Wires): ₹170
    - Volcano Craft Kit (Plastic cup, chart paper, paint, glue, cotton): ₹400
    - **Total Estimated Project Cost: ₹720**

8. The Dancing Droplets

- **What it Does:** A small water pump creates a splash or a jet of water in response to music or loud sounds, visualizing sound waves.
- **Key Components:** Sound Sensor Module, Mini Submersible Water Pump, Battery, a bowl.
- **Detailed Creative Idea:** Place the submersible pump in a clear, decorative bowl filled with water. Add a few drops of food coloring for a dramatic effect. The kids can play different types of music—fast, slow, loud, soft—near the sound sensor and watch how the water reacts. The setup becomes a "magical spring" or a "musical fountain" that "dances" in perfect rhythm to the beat.
- **Cost Estimation (Approximate):**
    - Mini Submersible Water Pump (5V): ₹200
    - Sound Sensor Module & Relay: ₹230
    - Power Kit (Battery holder, Batteries, Wires): ₹120
    - Setup Supplies (Decorative bowl, pipe, food coloring): ₹300

- **Total Estimated Project Cost: ₹850**

C. Motion & Touch-Based Projects

9. The Air-Gesture Magic Fan

- **What it Does:** A fan starts spinning when you wave your hand over a proximity sensor, without any physical contact.
- **Key Components:** IR Proximity Sensor, Transistor, DC Motor with Fan, Battery.
- **Detailed Creative Idea:** This project is framed as a "wizard's training" tool for learning telekinesis. The kids are learning to use "the force" or "magic" to control objects. By waving their hand over the "enchanted crystal" (the IR sensor), they can command the wind itself, making the fan spin as if by magic. Encourage them to make a wizard's hat and wand to complete the experience.
- **Cost Estimation (Approximate):**
  - IR Proximity Sensor: ₹80
  - Motor Kit (DC Motor, Fan Blade, Switch): ₹100
  - Electronics Kit (Transistor, Wires, Breadboard): ₹170
  - Power Kit (Battery Holder, Batteries): ₹170
  - Decorative Stand/Enclosure: ₹250
  - **Total Estimated Project Cost: ₹770**

10. The Cookie Jar Guardian

- **What it Does:** An alarm sounds the moment a box lid or a drawer is opened, using a mechanical switch.
- **Key Components:** Limit Switch (a type of button), Buzzer, Battery.
- **Detailed Creative Idea:** Install the circuit inside a cookie jar or a "secret diary" box. The limit switch is carefully placed so that its button is pressed down when the lid is closed. The moment an unauthorized person opens the lid, the button is released, triggering a loud alarm. It's a fun and practical way to teach them about the mechanics of normally open and normally closed switches.
- **Cost Estimation (Approximate):**
  - Limit Switch: ₹40
  - Buzzer: ₹30
  - Power Kit (9V Battery, Connector, Wires): ₹130
  - Project Box/Jar & Decorations: ₹500
  - **Total Estimated Project Cost: ₹700**

11. The Bump-and-Turn Ant

- **What it Does:** A simple robot that automatically changes direction when one of its mechanical "whiskers" makes contact with an obstacle.
- **Key Components:** 2 Limit Switches (as whiskers), 2 DC Motors with Wheels, Battery, Cardboard chassis.
- **Detailed Creative Idea:** Design the robot to look like a curious ant exploring its environment. The long, flexible arms of the limit switches act as the ant's sensitive antennae. When one antenna hits a wall, it activates its switch, which cleverly reverses the motor on the opposite side, causing the ant to pivot and turn away from the obstacle before continuing on its journey.
- **Cost Estimation (Approximate):**
  - Bot Chassis Kit (2 Motors, 2 Wheels, Caster, Base): ₹350
  - Switches & Electronics (2 Limit Switches, DPDT Switch, Wires): ₹250
  - Power Kit (Battery Holder, 4xAA Batteries): ₹120
  - Craft Supplies for Ant Body: ₹160
  - **Total Estimated Project Cost: ₹880**

12. The Wobbly Penguin

- **What it Does:** An LED lights up or a buzzer sounds whenever the project is tilted past a certain angle.
- **Key Components:** Tilt Sensor (a small ball-in-tube switch), LED/Buzzer, Battery.
- **Detailed Creative Idea:** Build a cute, bottom-heavy penguin out of a plastic bottle and some modeling clay for weight. The tilt sensor is placed inside. When the penguin "wobbles" too much and is about to fall over, the ball inside the sensor rolls and completes the circuit. This makes the penguin "cry for help" by sounding the buzzer or flashing its LED nose, teaching kids about balance and center of gravity.
- **Cost Estimation (Approximate):**
  - Tilt Sensor: ₹50
  - Buzzer & LED Kit: ₹80
  - Power Kit (Coin Cell Battery & Holder, Wires): ₹120
  - Craft Supplies (Plastic bottle, clay for weight, paint, glue): ₹450
  - **Total Estimated Project Cost: ₹700**

13. The Helpful Robot Hand-Washer

- **What it Does:** A pump automatically dispenses a small amount of liquid soap or

sanitizer when a hand is placed under a sensor.

- **Key Components:** IR Proximity Sensor, Mini Water Pump, Battery, Bottle.
- **Detailed Creative Idea:** Decorate a soap dispenser bottle to look like a friendly robot or an elephant. The pump's tube is routed to come out of the robot's "hand" or the elephant's "trunk." When a hand is placed underneath the sensor, the helpful robot "gives" you a perfect portion of soap, making handwashing a fun and futuristic experience.
- **Cost Estimation (Approximate):**
  - Mini Submersible Water Pump & Pipe: ₹230
  - IR Proximity Sensor & Relay Module: ₹150
  - Power Kit (Battery Holder, Batteries): ₹120
  - Dispenser Bottle & Decoration Kit: ₹350
  - **Total Estimated Project Cost: ₹850**

D. Fun & Creative Bots

14. The Scribble Bot

- **What it Does:** A vibrating, off-balance robot that holds markers and draws chaotic, random patterns on paper as it moves.
- **Key Components:** DC Motor with an off-center weight (like a piece of hot glue), Plastic Cup, Sketch Pens, Battery.
- **Detailed Creative Idea:** Call it the "Crazy Artist" or "The Art-o-matic." Let kids experiment with the number and color of pens, the position of the motor, and the shape of the cup to see how the drawings change. They can hold an "art exhibition" of the patterns created by their bots, giving each piece a unique name based on what they see in the abstract scribbles.
- **Cost Estimation (Approximate):**
  - DC Motor: ₹40
  - Power Kit (Battery Holder, Batteries, Switch): ₹100
  - Body & Art Supplies (Plastic cup, sketch pen set, hot glue stick, tape): ₹410
  - Large Chart Paper (for drawing surface): ₹150
  - **Total Estimated Project Cost: ₹700**

15. The Bristlebot Racer

- **What it Does:** A tiny, fast-moving bot made from a toothbrush head that skitters around erratically due to the vibrations of a small motor.
- **Key Components:** Vibrating Motor (from old phones or new), Toothbrush Head,

Coin Cell Battery.

- **Detailed Creative Idea:** It's time for the "Bristlebot Olympics!" Kids can decorate their bots with googly eyes and pipe cleaners to give them personality. Then, they can race them on a small track made of cardboard. You can also have a "sumo wrestling" event inside a circle, where the last bot remaining in the ring wins the gold medal.
- **Cost Estimation (Approximate):**
  - Vibrating Motor x 2: ₹100
  - Coin Cell Battery x 2 & Holder x 2: ₹100
  - Toothbrush x 2: ₹60
  - Craft Kit (Googly eyes, pipe cleaners, tape, markers): ₹250
  - Race Track / Sumo Ring (Cardboard, chart paper): ₹200
  - **Total Estimated Project Cost: ₹710**

16. The Junkbot Assemblage

- **What it Does:** A moving robot created entirely from recycled materials like bottles, boxes, and bottle caps, powered by a simple motor.
- **Key Components:** DC Motor, Battery, and lots of clean junk/recyclables.
- **Detailed Creative Idea:** The theme is "Imagination Unleashed." Provide a large pile of clean "junk"—plastic bottles, cardboard boxes, bottle caps, yogurt cups, etc.—and the basic electronic components. The challenge is to build the most creative-looking moving creature. It doesn't have to be a car; it could be a waddling monster, a wiggling caterpillar, or a spinning spaceship.
- **Cost Estimation (Approximate):**
  - Motor & Wheel Kit: ₹200
  - Power Kit (Battery Holder, Batteries, Switch, Wires): ₹120
  - Tool Kit (Hot glue gun & sticks, scissors, tape): ₹400
  - Junk Materials (Assumed free, but can budget for specific items): ₹80
  - **Total Estimated Project Cost: ₹800**

17. The Propeller Racer

- **What it Does:** A lightweight car that is pushed forward by the air thrust generated by a fast-spinning propeller.
- **Key Components:** DC Motor, Propeller, Battery, Lightweight chassis (straws, cardboard).
- **Detailed Creative Idea:** Design a futuristic "land-speeder" or a rugged "swamp boat." The kids can experiment with different propeller sizes, blade angles, and

chassis weights to understand the basics of thrust and aerodynamics. They can then hold races to see who can design their racer to go the fastest or the farthest.

- **Cost Estimation (Approximate):**
  - High-Speed DC Motor & Propeller: ₹180
  - Power Kit (9V Battery, Connector, Switch): ₹100
  - Chassis Kit (Wheels, Axles, Straws, Ice cream sticks): ₹200
  - Craft & Tool Kit (Glue gun, tape, cardboard): ₹350
  - **Total Estimated Project Cost: ₹830**

18. The Crawling Inchworm

- **What it Does:** A robot that moves forward with a realistic crawling motion by contracting and expanding its body, mimicking an inchworm.
- **Key Components:** DC Motor with a crank mechanism, Cardboard/Plastic body segments.
- **Detailed Creative Idea:** Build the body from several folded cardboard segments connected by paper fasteners. The motor's rotating crank arm pulls and pushes the segments together and apart, creating a surprisingly realistic crawling motion. Decorate it with green colors, googly eyes, and pipe cleaner antennae to make it look like a friendly caterpillar on a mission.
- **Cost Estimation (Approximate):**
  - Geared DC Motor: ₹200
  - Power Kit (Battery Holder, Batteries, Switch): ₹120
  - Mechanical Parts (Plastic/metal strips for crank, nuts, bolts): ₹130
  - Body & Craft Supplies (Cardboard, paper fasteners, paint, glue): ₹300
  - **Total Estimated Project Cost: ₹750**

E. Environmental & Magical Projects

19. The Mood Stone

- **What it Does:** An LED changes color or brightness based on the ambient temperature, detected by a thermistor.
- **Key Components:** Thermistor (temperature sensor), Transistor, Red/Blue LEDs, Battery.
- **Detailed Creative Idea:** Frame it as a "mood stone" or a "weather rock." When you touch the sensor with a warm hand, the red "angry" or "passionate" LED

glows. When you touch it with an ice pack or a cold drink, the blue "calm" or "sad" LED glows. It's a magical way to visualize temperature changes and learn how thermistors work.

- **Cost Estimation (Approximate):**
  - Electronics Kit (Thermistor, Transistors, Red/Blue LEDs, Resistors): ₹250
  - Power & Prototyping (Breadboard, 9V Battery, Connector, Wires): ₹180
  - Enclosure Kit (Project box, clay, decorative stones, glue): ₹350
  - **Total Estimated Project Cost: ₹780**

20. The Wizard's Magic Wand

- **What it Does:** Touching a secret, unmarked spot on a box with a special "magic wand" makes an LED light up or a buzzer sound.
- **Key Components:** Reed Switch, Magnet, LED/Buzzer, Battery.
- **Detailed Creative Idea:** Hide the tiny reed switch inside a decorated "enchanted box." Hide a small, strong magnet in the tip of a "magic wand" (a decorated stick or dowel). When the wand's tip touches the spot on the box where the reed switch is hidden, the invisible magnetic field closes the switch and completes the circuit. The kids have to discover the "secret spot" to unlock the magic.
- **Cost Estimation (Approximate):**
  - Magic Kit (Reed Switch, Magnet, Buzzer, LED): ₹200
  - Power Kit (Battery, Holder, Wires): ₹130
  - Wand & Box Craft Kit (Wooden dowel, decorative box, paint, glitter, glue): ₹400
  - **Total Estimated Project Cost: ₹730**

21. The Wind Power Generator

- **What it Does:** Spinning a propeller, either by blowing on it or holding it in the wind, generates enough electricity to light up a small LED.
- **Key Components:** DC Motor (used as a generator), Propeller, LED.
- **Detailed Creative Idea:** Build a small windmill as the centerpiece of a model village. When kids blow on the propeller or hold it in front of a fan, the motor acts as a generator. The LED, placed inside one of the miniature houses, lights up, providing a clear and satisfying demonstration of how clean, renewable wind energy can be harnessed to power our homes.
- **Cost Estimation (Approximate):**
  - Generator Kit (DC Motor, Propeller, LED): ₹150
  - Model Village Kit (Cardboard for houses, base, paint, glue): ₹450

- Tools (Scissors, craft knife): ₹150
- **Total Estimated Project Cost: ₹750**

22. The Thirsty Plant Alert

- **What it Does:** A buzzer sounds when the water in a cup reaches a certain level, demonstrating a basic conductivity sensor.
- **Key components:** 2 Wires, Transistor, Buzzer, Battery.
- **Detailed Creative Idea:** Place two bare wires into a cup, making sure they don't touch. As you pour water, it will eventually rise to a level where it connects the two wires. Because water is conductive, it completes the circuit and sounds the alarm. Frame it as a "thirsty plant" in a pot that "shouts" when it has had enough water to drink, preventing overwatering.
- **Cost Estimation (Approximate):**
  - Electronics Kit (Transistor, Buzzer, Resistor): ₹150
  - Power Kit (9V Battery, Connector, Wires): ₹130
  - Plant Setup (Pot, soil, artificial plant, cup): ₹450
  - **Total Estimated Project Cost: ₹730**

23. The Floating Magic Carpet

- **What it Does:** Using the powerful and invisible force of magnetic repulsion to make a small, decorated object levitate above a base.
- **Key Components:** Strong Ring Magnets, Pencil/Dowel.
- **Detailed Creative Idea:** Stick several ring magnets onto a base with their north poles facing up. Then, stick corresponding magnets on a pencil with their north poles facing down. The opposing forces will push the pencil up, making it levitate. Decorate the pencil with a small piece of felt to look like a magic carpet or a futuristic spaceship hovering in mid-air.
- **Cost Estimation (Approximate):**
  - Ring Magnets (Set of 10): ₹400
  - Base & Stand (Wooden block, dowel): ₹200
  - Decoration Kit (Felt for carpet, paint, glue, glitter): ₹250
  - **Total Estimated Project Cost: ₹850**

24. The Hissing Snake

- **What it Does:** A snake made of a spring or flexible wire that wiggles and vibrates with a surprisingly realistic slithering motion.

- **Key Components:** Vibrating Motor, a long spring or flexible wire, Battery.
- **Detailed Creative Idea:** Attach the vibrating motor to one end of a long spring. Decorate the spring with green and yellow electrical tape to look like a snake, complete with a cardboard head, googly eyes, and a forked tongue. When switched on, the motor's vibrations travel down the spring, causing it to wiggle and move across the floor like a real snake.
- **Cost Estimation (Approximate):**
  - Vibrating Motor: ₹50
  - Power Kit (Battery Holder, Batteries, Switch): ₹150
  - Snake Body (Long spring or thick flexible wire): ₹200
  - Decoration Kit (Colored tape, cardboard, googly eyes, glue): ₹300
  - **Total Estimated Project Cost: ₹700**

25. The Automatic Railway Gate

- **What it Does:** A crossing gate, made from a simple lever, automatically closes when a toy train passes over a switch, demonstrating simple automation.
- **Key Components:** Limit Switch, Servo Motor (or DC motor with a string mechanism), Battery.
- **Detailed Creative Idea:** Build a small railway track scene with roads, trees, and a station. The toy train's weight presses the limit switch as it approaches the crossing. This activates the motor, which pulls a string to lower a crossing gate made from an ice cream stick, stopping any "cars" on the road. It's a fantastic, tangible demonstration of how automated systems work in the real world.
- **Cost Estimation (Approximate):**
  - Servo Motor (SG90): ₹200
  - Limit Switch: ₹40
  - Power Kit (Battery Holder, Batteries, Wires): ₹120
  - Scenery Kit (Cardboard base, toy track, ice cream sticks, paint, glue): ₹340
  - Toy Train (basic): ₹200
  - **Total Estimated Project Cost: ₹900**

Overall Estimated Cost

- **Total Estimated Cost for All 25 Projects: ₹19,490**

Note: These prices are approximate and can vary based on the vendor and location