STEM LABS

Explore • Build • Innovate

Grade-wise Projects List

Electronics • Blix / Mechanical • 3D Pen • 3D Printer • Drone

Grades 3 to 9 | Electronics ordered Basic → Advanced per Grade

■ Electronics	■ Blix	■ 3D Pen	■ 3D Printer	■ Drone

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■ Electronics	■ Blix	■ 3D Pen	■ 3D Printer	■ Drone

Grade 3 — Beginner — Explore & Discover

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Introduction to Blix construction kit — identify parts, build basic structures and understand how mechanical models work.
2	Electronics	**LED On/Off with Push Button**	Build a basic circuit to turn an LED on and off using a push button — no Arduino needed. Learn about current flow and resistors.
3	Blix	**Make Your Own Specs**	Build a wearable spectacle frame using Blix parts — understand frame structure, joints, and creative design.
4	Electronics	**Traffic Light (3 LEDs + Button)**	Manually switch red, yellow, green LEDs using a push button to simulate a traffic light sequence.
5	Blix	**Car Model**	Assemble a basic rolling car model using Blix — learn about axles, wheels, and chassis structure.
6	Electronics	**Buzzer Alarm Circuit**	Trigger a buzzer by pressing a button — introduces the concept of output actuation in a simple circuit.
7	Electronics	**Blinking LED (Arduino Intro)**	First Arduino sketch using delay() to blink an LED — introduction to the IDE, upload process, and loop structure.
8	Blix	**Gear Mechanism**	Build a gear train using Blix parts — understand how gears transfer and multiply rotational motion.
9	Electronics	**Button-controlled LED**	Read a button input (digitalRead) and control an LED output (digitalWrite) — fundamentals of digital I/O.
10	Electronics	**Multiple LED Pattern**	Create chasing/knight-rider LED patterns using arrays and for loops on Arduino.
11	Blix	**Windmill**	Construct a working windmill model using Blix — learn about rotational energy and blade design.
12	Electronics	**Doorbell Circuit**	Button press plays a buzzer tone — simulate a simple doorbell using the tone() function.
13	Blix	**Giant Wheel**	Build a giant wheel (Ferris wheel) model — understand circular motion, balance, and axle support.
14	Electronics	**LED Brightness Control (PWM)**	Use analogWrite (PWM) to gradually change LED brightness from dim to bright in a loop.
15	Electronics	**Two-player Reaction Game**	LED lights randomly; first player to press their button wins — basic timing and input-reading game.
16	3D Pen	**3D Pen Intro & Free Creation**	Introduction to 3D pen — learn to control speed and temperature; trace basic shapes and create a small object.

Grade 4 — Beginner+ — Sensors & Displays

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Recap Blix fundamentals — identify electronic components and understand how sensors connect to Arduino.
2	Electronics	**Blinking LED (Delay Variations)**	Experiment with different blink speeds using delay() — introduces loop control and timing concepts.
3	Blix	**Make Your Own Specs**	Design and build a personalised spectacle frame using Blix — focus on symmetry and joint stability.
4	Electronics	**Dark Light Indicator**	LDR detects darkness and automatically turns on LED and buzzer — introduces analogRead and threshold logic.
5	Blix	**Dancing Robot**	Assemble a dancing robot using Blix parts — understand linkage mechanisms that convert rotation to dance motion.
6	Electronics	**Object Detection Alert**	IR sensor detects objects and triggers a buzzer + LED alert — digital sensor reading and output control.
7	Electronics	**Rain Detector**	Detect rain/moisture and alert with LED + buzzer — introduces sensor threshold and conditional logic.
8	Blix	**Crank and Slider Mechanism**	Build a crank-slider model using Blix — understand how rotary motion converts to linear (back-and-forth) motion.
9	Electronics	**OLED Hello World**	Display text and basic shapes on OLED screen — introduces I2C communication and Adafruit library.
10	Blix	**Swinging Machine**	Build a swinging pendulum machine using Blix — explore oscillation and momentum in mechanical systems.
11	Electronics	**Distance Meter**	Measure distance using HC-SR04 ultrasonic sensor and display value in cm on the OLED screen.
12	Electronics	**Smart Night Lamp**	LED auto-turns on when room gets dark — LDR analog value mapped to LED state using threshold.
13	Blix	**Windmill**	Build an advanced windmill model with Blix — focus on blade angle, gear linkage and rotation stability.
14	Electronics	**Intruder Alert System**	IR beam broken by a person triggers a sustained alarm + red LED — simulate a basic security sensor.
15	Electronics	**Digital Counter on OLED**	Press button to increment a counter displayed on OLED — introduces button debounce and state variables.
16	3D Pen	**3D Pen — Structured Models**	Use 3D pen to build a structured object (bridge, tower, or name plate) — focus on layering and form.
17	Electronics	**Proximity Warning System**	Buzzer beeps faster and LEDs change colour zones as an object comes closer — proximity zone logic.

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Grade 5 — Elementary — Automation Concepts

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Introduction session — revisit Blix parts and explore how automation links mechanics with electronics.
2	Electronics	**Blinking LED & Intro to Arduino IDE**	Quick recap of Arduino basics — upload blink sketch, modify delays, understand the setup/loop structure.
3	Blix	**Make Your Own Specs**	Build spectacle frames with Blix — experiment with different hinge designs for comfort and strength.
4	Electronics	**Smart Parking Indicator**	Ultrasonic sensor detects vehicle distance — green/yellow/red LEDs indicate parking zones.
5	Blix	**Rollie Car**	Build a rolling car with Blix — focus on wheel alignment, axle placement, and smooth motion.
6	Electronics	**Automatic Street Light**	LDR detects darkness and auto-switches a street light on via relay — real-world automation concept.
7	Blix	**Giant Wheel**	Build a large Ferris wheel model — focus on spoke symmetry, load balance, and smooth axle rotation.
8	Electronics	**Rain Detector with Auto Wiper (Servo)**	Rain sensor triggers a servo motor to sweep like a windshield wiper — sensor-to-actuator automation.
9	Blix	**Windmill**	Build a windmill with gear linkage — understand how blade rotation drives a gear train.
10	Electronics	**Automatic Door (Servo)**	IR sensor detects a person and opens/closes a servo-actuated door automatically after a set delay.
11	Blix	**Reciprocating Motion Mechanism**	Build a model that converts rotation to back-and-forth motion using Blix cranks and connectors.
12	Electronics	**Auto Water Pump (Soil Moisture)**	Soil moisture below threshold triggers a mini water pump via relay — plant irrigation automation.
13	Blix	**Crank and Slider Mechanism**	Advanced crank-slider build — analyse how stroke length changes with crank arm size.
14	Electronics	**DOT Matrix Scrolling Text**	Scroll custom messages on the MAX7219 DOT matrix display using SPI communication.
15	Blix	**Swinging Machine**	Build a swinging machine with adjustable pendulum length — study period of oscillation.
16	Electronics	**Temperature & Humidity Display**	Read DHT11 sensor and display live temperature and humidity values on the OLED screen.
17	Electronics	**Light-controlled Fan**	DC motor (fan) switches on via relay when LDR detects bright light — analog threshold logic.
18	3D Pen	**3D Pen — Creative Project**	Design and build a 3D pen model of student's choice — focus on planning, layering, and finishing.
19	Electronics	**DIY Project**	Student designs a mini automation project using any sensors and actuators from the kit.

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Grade 6 — Intermediate — Multi-sensor Systems

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Intro session — explore how multi-sensor electronics integrate with mechanical Blix models.
2	Electronics	**Blinking LED & Arduino Recap**	Quick Arduino IDE recap — upload blink, adjust timing, discuss digital vs analog pins.
3	Blix	**Make Your Own Specs**	Design and construct spectacle frames with personalised styling using Blix components.
4	Electronics	**Glow Meter (LDR + Potentiometer)**	Measure light intensity and calibrate reading using a potentiometer — introduces analogWrite PWM output.
5	Blix	**Dancing Robot**	Build a dancing robot with Blix linkages — study how cam and follower mechanisms produce dance motion.
6	Electronics	**Distance Display System (Ultrasonic)**	Ultrasonic sensor measures distance; OLED displays the reading with near/far zone indication.
7	Blix	**Crank It Up**	Build a crank mechanism that lifts a load — explore mechanical advantage and effort vs load.
8	Electronics	**Smart Irrigation (Soil Moisture Sensor)**	Combine soil moisture and temperature data to intelligently control a water pump via relay.
9	Blix	**Reciprocating Motion Mechanism**	Build an advanced reciprocating model — analyse speed and stroke length variation with crank size.
10	Electronics	**Visitor Counter (IR Sensor)**	IR sensor counts people passing through and displays live count on OLED — interrupt logic.
11	Blix	**Shift Roller Car**	Build a car with a gear-shift mechanism using Blix — understand how gear ratios change speed and torque.
12	Electronics	**Musical Piano (Push Buttons + Buzzer)**	Map 5 push buttons to musical note frequencies — play simple tunes using the tone() function.
13	Blix	**Windmill**	Build a windmill with adjustable blade pitch — study how blade angle affects rotation speed.
14	Electronics	**Attendance System (Pressure Sensor)**	Press sensor pad to register attendance — count is shown on scrolling DOT matrix display.
15	Blix	**Giant Wheel**	Construct a giant wheel with passenger gondolas — study load distribution and rotational balance.
16	Electronics	**Sound-activated Light**	Clap to toggle LEDs on/off — analog sound threshold detection with software debounce.
17	Electronics	**Temperature & Humidity Logger (DHT11)**	Real-time temperature and humidity on OLED with high/low alert indicators using DHT11.
18	Drone	**Intro to Drone**	Introduction to drone anatomy — understand frame, propellers, ESC, motors, and flight controller basics.
19	3D Printer	**Intro to 3D Printer**	Introduction to 3D printing — understand FDM process, slicing software, and print a basic sample object.
20	Electronics	**DIY Project**	Student identifies a problem and builds a multi-sensor solution using components from the kit.

Grade 7 — Intermediate+ — Robotics & Actuators

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Intro session — explore how robotics combines Blix mechanical builds with Arduino-controlled actuators.
2	Electronics	**Blinking LED & Arduino Recap**	Quick recap of Arduino IDE — review digital/analog I/O, PWM pins, and serial monitor basics.
3	Blix	**Make Your Own Specs & Rollie Car**	Build both spectacle frame and a rolling Blix car in the same session — practice assembly speed and precision.
4	Electronics	**Smart Room Light (LDR + Relay)**	Automatically switch a room light using LDR and relay — real-world home automation concept.
5	Blix	**Dancing Robot**	Build a dancing robot — study how eccentric cam mechanisms create rhythmic, unpredictable motion.
6	Electronics	**Fan Speed Controller (Potentiometer + PWM)**	Rotate potentiometer to control DC motor speed using PWM — analogRead mapped to motor speed.
7	Blix	**Crank It Up**	Advanced crank mechanism — add a load and measure mechanical advantage at different crank lengths.
8	Electronics	**Smart Farming System (Multi-sensor)**	Soil moisture + DHT11 together trigger pump via relay and buzzer alert on high temperature.
9	Blix	**Reciprocating Motion Mechanism**	Advanced reciprocating model with variable stroke — connect to a pump or piston simulation.
10	Electronics	**Obstacle Avoiding Robot**	Robot detects obstacles using ultrasonic sensor and steers away — motor driver + decision logic.
11	Blix	**Shift Roller Car**	Build a gear-shift car and compare speed/torque at different gear ratios — racing challenge.
12	Electronics	**Joystick-controlled Car**	X/Y joystick axes mapped to forward/reverse/left/right for a 2-motor DC car via motor driver.
13	Blix	**Windmill**	Build a windmill connected to a small generator concept — measure resistance variation with rotation speed.
14	Electronics	**Tilt Alarm (MPU6050)**	MPU6050 accelerometer detects tilt or vibration and triggers a buzzer — introduces I2C sensor.
15	Blix	**Giant Wheel**	Build a motorised giant wheel — attach a DC motor and control speed with potentiometer.
16	Electronics	**Hospital Alert Model (Pressure Sensor)**	Pressure sensor simulates patient bed weight — triggers nurse call alert on OLED + buzzer.
17	Electronics	**Motion-based Security Light**	IR detects motion at night (LDR confirms dark) — relay switches light on with buzzer alert.
18	Drone	**Intro to Drone**	Hands-on drone session — identify components, understand flight physics (lift, thrust, drag, weight) and basic controls.
19	3D Printer	**Intro to 3D Printer**	3D printing session — design a simple object in slicing software and observe or operate a print job.
20	Electronics	**DIY Project**	Student designs and presents a robotics or automation project using actuators from the kit.

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Grade 8 — Advanced — Real-world Projects

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Intro session — discuss advanced integration of Blix mechanical builds with complex electronic systems.
2	Electronics	**Blinking LED & Arduino Recap**	Quick recap — review PWM, analog sensors, serial monitor, and library installation.
3	Blix	**Dancing Robot**	Build a dancing robot with custom choreography — modify linkage lengths to change dance style.
4	Electronics	**Automatic Street Light (LDR + Relay)**	LDR detects darkness and auto-switches street light on via relay — threshold calibration included.
5	Blix	**Swift Roller Car**	Build a fast roller car with optimised gear ratio using Blix — race and compare speed.
6	Electronics	**Soil Moisture Detection & Alert**	Soil moisture sensor reads value — LED + buzzer alerts when soil is too dry or too wet.
7	Blix	**Windmill**	Build a windmill with maximum efficiency blade design — test different blade angles and counts.
8	Electronics	**Smart Dustbin (Ultrasonic + Servo)**	Ultrasonic detects approaching hand — servo opens lid automatically and closes after 3-second delay.
9	Blix	**Forklift**	Build a working forklift model using Blix — understand lifting mechanism, counterweight, and stability.
10	Electronics	**Musical Piano (Buttons + Buzzer)**	5 push buttons mapped to musical notes — play and record simple melodies using tone() function.
11	Blix	**Giant Wheel**	Build a motorised giant wheel with Blix — add DC motor, control with joystick speed input.
12	Electronics	**Blind Man Stick (Ultrasonic + Buzzer)**	Buzzer beeps faster as object gets closer — proximity-based walking aid simulation.
13	Blix	**Reciprocating Motion Mechanism**	Advanced reciprocating build — connect to a pump mechanism and simulate a piston engine.
14	Electronics	**Smoke & Gas Detection Alarm**	MQ gas + smoke sensor detects harmful levels — triggers buzzer alarm and cuts power via relay.
15	Electronics	**Theft Alarm System (IR + Buzzer)**	Breaking IR beam triggers sustained alarm + red LED — simulates a security laser trip wire.
16	Electronics	**Smart Parking System**	Two ultrasonic sensors track entry/exit — servo gate controlled, OLED shows available slot count.
17	Electronics	**Panic Alert System**	Hold button 3 seconds to trigger SOS blink pattern (3-3-3) and continuous buzzer.
18	Electronics	**Automatic Hand Wash Timer**	IR proximity triggers soap pump via relay; buzzer counts down a 20-second wash timer.
19	Electronics	**Radar System (Servo + Ultrasonic + OLED)**	Servo sweeps 0–180°; OLED displays angle and distance of detected objects in real time.
20	Electronics	**Snake Game using Arduino**	Classic snake game on 128×64 OLED controlled by joystick — full game loop and collision logic.
21	Electronics	**Obstacle Follower / Avoidance Robot**	IR + ultrasonic sensors toggle between following and avoiding obstacles via motor driver logic.
22	3D Pen	**3D Pen — Advanced Model**	Build a complex 3D pen model (robot, vehicle, or architecture) — focus on structural strength and detail.
23	3D Printer	**3D Printer — Print a Custom Part**	Design a custom part (bracket, enclosure, or tool) and print it — understand supports and infill settings.

S.No	Category	Project Name	Description
24	Drone	**Drone — Hands-on Flying Session**	Fly a drone in controlled space — practice takeoff, hover, and landing; understand pitch/roll/yaw controls.

Grade 9 — Expert — Integrated Systems

S.No	Category	Project Name	Description
1	Blix	**Intro to Techno Blocks / Blix & Electronics**	Intro session — plan capstone project integrating Blix mechanical design with an advanced electronics system.
2	Electronics	**Blinking LED & System Review**	Full system review — Serial monitor debugging, library management, multi-file sketches.
3	Blix	**Dancing Robot**	Design a custom dancing robot with modified linkage geometry — present and explain the mechanism.
4	Electronics	**Automatic Street Light (Advanced Calibration)**	Advanced version with potentiometer-calibrated LDR threshold and relay-controlled mains simulation.
5	Blix	**Swift Roller Car**	Optimise roller car design for speed — experiment with gear ratios and wheel diameter.
6	Electronics	**Soil Moisture Detection & Smart Alert**	Multi-level moisture monitoring — green/yellow/red LED zones + buzzer + OLED percentage display.
7	Blix	**Windmill**	Build a windmill integrated with an LED — rotation generates enough movement to light an LED via motor-as-generator.
8	Electronics	**Smart Dustbin (Auto Lid)**	Ultrasonic detects hand — servo opens lid; OLED shows fill level using second ultrasonic sensor.
9	Blix	**Forklift**	Build a Blix forklift with servo-controlled lift mechanism — pick and place small objects.
10	Electronics	**Musical Piano with Recording**	Play notes with buttons and replay the sequence — introduces arrays for storing user input sequences.
11	Blix	**Giant Wheel**	Build a motorised giant wheel with LED lighting — synchronise LED blink with rotation speed.
12	Electronics	**Blind Man Stick with Zone Alerts**	Ultrasonic with 3 distance zones — different buzzer patterns and LED colours for each zone.
13	Blix	**Reciprocating Motion Mechanism**	Connect reciprocating Blix mechanism to a sensor — motion triggers readings (e.g. piston air pump).
14	Electronics	**Smoke & Gas Alarm with Auto Ventilation**	Gas/smoke detected — alarm triggers AND relay activates a DC fan for automatic ventilation.
15	Electronics	**Smart Parking System (Full)**	Complete parking system — entry/exit ultrasonic, servo gate, OLED slot count, and LED indicator board.
16	Electronics	**Panic Alert with SOS Display**	Button triggers SOS on OLED + buzzer + LED — logs alert count and shows time since last alert.
17	Electronics	**Radar System with Dot Matrix Display**	Servo sweeps ultrasonic sensor; dot matrix visualises object presence like a radar blip in real time.
18	Electronics	**Snake Game on OLED**	Full snake game on 128×64 OLED with joystick, score tracking, speed increase, and game-over screen.
19	Electronics	**Obstacle Follower / Avoidance Robot**	Advanced dual-mode robot — toggle between follow and avoid with button; OLED shows current mode.

S.No	Category	Project Name	Description
20	3D Pen	**3D Pen — Capstone Model**	Build a 3D pen model that complements the electronics project — enclosure, stand, or decorative part.
21	3D Printer	**3D Printer — Print Project Enclosure**	Design and print a custom enclosure or mount for the capstone electronics project.
22	Drone	**Drone — Advanced Flying & Mission**	Drone obstacle course session — navigate a defined path, practice precision landing and directional control.