

ROBOTICS & AI CURRICULUM

K – 10 Comprehensive Learning Path
NEP 2020 Aligned · 250 Hands-On Sessions

400 Total Sessions	10 Classes	200 Primary (1–5)	200 Secondary (6–10)
------------------------------	----------------------	-----------------------------	--------------------------------

Level Overview

Primary Classes 1 – 5 150 Sessions	Intermediate Classes 6 – 9 80 Sessions	Advanced Class 10 20 Sessions
---	---	--

Class 1 · Primary Robotics

PRIMARY LEVEL

Part 1 — Foundation & Curiosity		Sessions 1–10
Session	Topic	
01	What is a machine?	
02	Things that move and things that don't	
03	Push and pull forces	
04	Wheels and rollers	
05	Levers and seesaws	
06	Ramps and slopes	
07	Parts of a machine	
08	Machines at home	
09	Machines in my village	
10	My favorite machine	

Part 2 — Logic & Basic Systems		Sessions 11–20
Session	Topic	
01	What is a sequence?	
02	First, then, last	
03	My morning routine algorithm	
04	Directions: forward, backward, left, right	
05	Patterns with shapes	
06	Patterns with colours	
07	Sorting and grouping	
08	If this, then that	
09	Robot walk game (unplugged)	
10	Repeating instructions (loops)	

Part 3 — Mini Robotics Applications		Sessions 21–30
Session	Topic	
01	Parts make a whole	
02	Wind-up toys and stored energy	
03	Paper robot assembly	
04	Cause and effect in machines	
05	Robots that help people	
06	A robot for my village	
07	My dream robot drawing	
08	Robot story: the rice field helper	
09	Build and share challenge	
10	Class robot book creation	

Class 2 · Primary Robotics

PRIMARY LEVEL

Part 1 — Foundation & Curiosity		Sessions 1–10
Session	Topic	
01	Forces that move things	
02	Friction: rough vs. smooth	
03	Gravity pulls things down	
04	Magnets: attract and repel	
05	Sorting with magnets	
06	Electric motors: spin and move	
07	What is energy?	
08	Batteries store energy	
09	How a fan works	
10	Human-machine comparison	

Part 2 — Logic & Basic Systems		Sessions 11–20
Session	Topic	
01	Electricity flows in a path	
02	Parts of a circuit	
03	Building my first circuit	
04	Open and closed circuits	
05	Switch: on and off	
06	Conductors and insulators	
07	My homemade switch	
08	Circuit troubleshooting	
09	Drawing a circuit diagram	
10	Multi-bulb circuit challenge	

Part 3 — Mini Robotics Applications		Sessions 21–30
Session	Topic	
01	Motor connected to battery	
02	Cardboard motor bot build	
03	Watching my bot move	
04	Controlling direction manually	
05	Obstacle path challenge	
06	Energy to motion: the full story	
07	Two motors vs. one motor	
08	Design your helper robot	
09	Village problem: what can a robot do?	
10	Present my robot idea	

Class 3 · Primary Robotics

PRIMARY LEVEL

Part 1 — Foundation & Curiosity		Sessions 1–10
Session	Topic	
01	What is an algorithm?	
02	Precision in instructions	
03	Debugging: finding mistakes	
04	Loops: repeat this step	
05	Conditions: if–then	
06	Input and output thinking	
07	Floor robot navigation game	
08	Debugging a wrong path	
09	Writing instructions for a friend	
10	Algorithm relay challenge	

Part 2 — Logic & Basic Systems		Sessions 11–20
Session	Topic	
01	Introduction to Scratch Jr.	
02	Sprites and backgrounds	
03	Move and turn blocks	
04	Say and change colour blocks	
05	When-clicked event	
06	Repeat loop in Scratch	
07	Animate my name	
08	The dancing robot sprite	
09	My village story animation	
10	Share and feedback session	

Part 3 — Mini Robotics Applications		Sessions 21–30
Session	Topic	
01	What is a programmable robot?	
02	mBot introduction and parts	
03	Connecting code to movement	
04	Move forward and backward	
05	Turn left and turn right	
06	Speed and distance basics	
07	mBot wakeup challenge	
08	Robot maze navigator	
09	Blinky: the signal bot	
10	Reflection: code meets machine	

Class 4 · Primary Robotics

PRIMARY LEVEL

Part 1 — Foundation & Curiosity		Sessions 1–10
Session	Topic	
01	What is a sensor?	
02	Human senses vs. robot sensors	
03	Sensor types overview	
04	Input–process–output model	
05	Automatic doors and streetlights	
06	Clap switch demonstration	
07	Designing a sensor robot	
08	Sensors in agriculture	
09	Sense map challenge	
10	Local problem sensor brainstorm	

Part 2 — Logic & Basic Systems		Sessions 11–20
Session	Topic	
01	If–then–else in Scratch	
02	Variables: storing information	
03	Events and triggers	
04	Smart traffic light program	
05	Flood alert simulator	
06	Nested conditions	
07	Score tracking with variables	
08	Broadcasting between sprites	
09	Quiz bot project	
10	Test and debug session	

Part 3 — Mini Robotics Applications		Sessions 21–30
Session	Topic	
01	Ultrasonic sensor introduction	
02	Measuring distance with code	
03	Obstacle stopper bot	
04	Light sensor and threshold	
05	Night light bot program	
06	If object detected then turn	
07	Line follower concept	
08	Sensor calibration practice	
09	Automatic streetlight project	
10	Sensor integration challenge	

Class 5 · Primary Robotics

PRIMARY LEVEL

Part 1 — Foundation & Curiosity		Sessions 1–10
Session	Topic	
01	Engineering design process: overview	
02	Empathise: understanding user needs	
03	Define: writing a problem statement	
04	Ideate: brainstorming solutions	
05	Sketch and prototype	
06	Problem hunt walk	
07	Design sprint: school bag bot	
08	Empathy interview with a farmer	
09	Team roles in engineering	
10	Feedback and redesign	

Part 2 — Logic & Basic Systems		Sessions 11–20
Session	Topic	
01	Multiple scenes in Scratch	
02	Lists and multiple variables	
03	Score and game logic	
04	Broadcasting events	
05	Simulation: modelling a real system	
06	Flood warning system simulation	
07	Smart farming dashboard	
08	Interactive quiz game	
09	Debugging complex programs	
10	Peer code review session	

Part 3 — Mini Robotics Applications		Sessions 21–30
Session	Topic	
01	Capstone project introduction	
02	Planning: materials and roles	
03	Smart plant watering system build	
04	Flood alert rover build	
05	Sensor + code integration	
06	Testing and iteration	
07	Refinement session	
08	Preparing the presentation	
09	Mini science fair demo day	
10	Reflection and learning review	

Class 6 · Intermediate Robotics

INTERMEDIATE LEVEL

Part 1 — Core Robotics & Electronics		Sessions 1–10
Session	Topic	
01	Introduction to Arduino Uno	
02	Components: resistor, LED, buzzer	
03	Breadboard layout and prototyping	
04	Digital I/O: HIGH and LOW	
05	pinMode and digitalWrite	
06	Blinking an LED: hello world	
07	Delay and timing	
08	Traffic light controller build	
09	Push button input reading	
10	Smart doorbell project	

Part 2 — Applied Robotics Systems		Sessions 11–20
Session	Topic	
01	Analog vs. digital signals	
02	analogRead and analogWrite	
03	LDR light sensor	
04	Threshold-based automation	
05	Automatic night lamp project	
06	HC-SR04 ultrasonic sensor	
07	Measuring and displaying distance	
08	Distance alert buzzer system	
09	Water level indicator build	
10	Multi-sensor integration challenge	

Class 7 · Intermediate Robotics

INTERMEDIATE LEVEL

Part 1 — Core Robotics & Electronics		Sessions 1–10
Session	Topic	
01	DC motor: speed and direction	
02	PWM: controlling motor speed	
03	L298N motor driver module	
04	Assembling a 2WD chassis	
05	First wheeled robot build	
06	Forward, backward, left, right code	
07	Speed controller with serial input	
08	SG90 servo motor control	
09	Pan-tilt mechanism build	
10	Joystick-controlled servo demo	

Part 2 — Applied Robotics Systems		Sessions 11–20
Session	Topic	
01	Autonomous vs. remote robots	
02	Obstacle avoidance algorithm	
03	Mounting ultrasonic on servo	
04	Scan left, scan right, decide	
05	Obstacle avoiding robot build	
06	IR sensor: line detection	
07	Two IR sensor line following	
08	Line follower build and calibrate	
09	State machine for robot behaviour	
10	Flood patrol bot final project	

Class 8 · Intermediate Robotics

INTERMEDIATE LEVEL

Part 1 — Core Robotics & Electronics		Sessions 1–10
Session	Topic	
01	Serial communication basics	
02	HC-05 Bluetooth module setup	
03	Bluetooth terminal app control	
04	Bluetooth controlled robot build	
05	IR remote decoding	
06	IR remote robot control	
07	MIT App Inventor introduction	
08	Custom app button layout	
09	Bluetooth app controlled robot	
10	WiFi module ESP8266 intro	

Part 2 — Applied Robotics Systems		Sessions 11–20
Session	Topic	
01	DHT11: temperature and humidity	
02	I2C LCD display interface	
03	Reading and displaying sensor data	
04	Soil moisture sensor	
05	IoT platform: ThingSpeak setup	
06	Uploading data to the cloud	
07	Blynk app: live dashboard	
08	Smart flood monitor station build	
09	Tea garden climate monitor build	
10	Color sensor object sorting bot	

Class 9 · Intermediate Robotics

INTERMEDIATE LEVEL

Part 1 — Core Robotics & Electronics		Sessions 1–10
Session	Topic	
01	What is artificial intelligence?	
02	Types of AI: narrow, ML, deep learning	
03	Supervised learning concept	
04	Training a model with labeled data	
05	Google Teachable Machine: image classifier	
06	Training gesture recognition model	
07	Gesture controlled robot build	
08	Plant disease detector prototype	
09	Web Speech API voice commands	
10	Voice command robot integration	

Part 2 — Applied Robotics Systems		Sessions 11–20
Session	Topic	
01	OpenCV introduction: capturing frames	
02	Colour detection in video stream	
03	Color tracking with camera	
04	Camera + robot chassis integration	
05	Color tracking robot build	
06	Object detection for sorting	
07	Servo gripper design and control	
08	Automated sorting arm project	
09	Sensor data + ML for prediction	
10	AI flood risk mapper dashboard	

Class 10 · Advanced Robotics

ADVANCED LEVEL

Phase 1 — Advanced Systems		Sessions 1–5
Session	Topic	
01	PID control: theory and tuning	
02	Advanced motor control with encoders	
03	Multi-axis robotic arm build	
04	Computer vision: object detection	
05	Power management for competition bots	

Phase 2 — Competition Preparation		Sessions 6–10
Session	Topic	
01	PID line follower: competition tuning	
02	Obstacle avoider: strategy and speed	
03	Sumo bot: chassis and power design	
04	Maze solver: wall-following algorithm	
05	Firefighter bot: detection and response	

Phase 3 — Problem-Solving Challenges		Sessions 11–15
Session	Topic	
01	Challenge 1: flood rescue mission bot	
02	Challenge 2: smart agriculture field node	
03	Challenge 3: disaster supply drop simulation	
04	Challenge 4: AI-powered intruder alert system	
05	Challenge 5: wearable assistive glove controller	

Phase 4 — Mini Capstone Project		Sessions 16–20
Session	Topic	
01	Capstone team formation and problem selection	
02	Design sprint: prototype planning	
03	Build session: hardware and code integration	
04	Testing, iteration, and refinement	
05	Innovation day: demo and presentation	

EXPERIMENT LISTS

Grade-wise Lab Progression

From basic observation to board-level practical execution.

Full Progression

Grade	Focus
Class 6	Observation & basics
Class 7	Concept understanding
Class 8	Application & real phenomena
Class 9	Lab fundamentals & measurement
Class 10	Board-level practical execution

Class 6 · Experiment List

FOUNDATION LEVEL 13 Experiments · 5 Categories

Basic Observation & Measurement		3 Experiments
#	Experiment	
01	Measurement of length using scale	
02	Volume measurement of liquids	
03	Estimation and comparison of objects	

Matter & Materials		3 Experiments
#	Experiment	
01	Solubility test (solid in water)	
02	Separation of mixtures (handpicking, filtration, sedimentation)	
03	States of matter observation	

Light & Shadows		3 Experiments
#	Experiment	
01	Formation of shadows	
02	Transparent, translucent, opaque materials	
03	Reflection basics using mirror	

Density & Floating		2 Experiments
#	Experiment	
01	Floating vs sinking objects	
02	Basic density comparison	

Environment & Water		2 Experiments
#	Experiment	
01	Simple water purification (filtration)	
02	Air presence experiments	

Class 7 · Experiment List

CONCEPT LEVEL 10 Experiments · 3 Categories

Chemistry		4 Experiments
#	Experiment	
01	Testing acids and bases using indicators	
02	Neutralization reaction	
03	Physical vs chemical changes	
04	Crystallization (basic)	

Physics		4 Experiments
#	Experiment	
01	Electric circuit (basic circuit making)	
02	Conductors vs insulators	
03	Heat transfer (conduction demo)	
04	Temperature measurement	

Environment		2 Experiments
#	Experiment	
01	Soil type testing	
02	Water filtration improvements	

Class 8 · Experiment List

APPLICATION LEVEL 10 Experiments · 3 Categories

Physics		4 Experiments
#	Experiment	
01	Friction between different surfaces	
02	Pressure in liquids (depth vs pressure)	
03	Sound production through vibrations	
04	Magnetic properties and attraction	

Electricity		3 Experiments
#	Experiment	
01	Making a simple electric tester	
02	Series and parallel circuits	
03	Conductivity testing	

Chemistry		3 Experiments
#	Experiment	
01	Metals vs non-metals properties	
02	Basic chemical reactions	
03	Electroplating (demonstration level)	

Class 9 · Experiment List

LAB FOUNDATION LEVEL9 Experiments · 3 Categories

Chemistry (Core Focus)		4 Experiments
#	Experiment	
01	True solution, colloid, suspension differentiation	
02	Separation techniques (filtration, evaporation)	
03	Crystallization	
04	Physical and chemical change identification	

Measurement & Density		3 Experiments
#	Experiment	
01	Density of solids (regular & irregular)	
02	Density of liquids	
03	Volume by water displacement	

Physics		2 Experiments
#	Experiment	
01	Motion basics (distance-time observation)	
02	Measurement accuracy and error	

Class 10 · Experiment List

BOARD PRACTICAL LEVEL 13 Experiments · 3 Categories

Chemistry		5 Experiments
#	Experiment	
01	pH testing (acids, bases, salts)	
02	Properties of acids and bases	
03	Types of chemical reactions	
04	Reactivity series experiments	
05	Soap in soft vs hard water	

Physics		5 Experiments
#	Experiment	
01	Verification of Ohm's Law	
02	Resistances in series and parallel	
03	Electric circuit construction	
04	Focal length of lens and mirror	
05	Refraction through glass slab	

Biology		3 Experiments
#	Experiment	
01	CO ₂ release during respiration	
02	Stomata observation (leaf peel)	
03	Microorganism / basic slide observation	

ADD-ONS FOR SCHOOLS

Enrichment & Skill-Building Labs

Four specialized labs that extend the curriculum beyond robotics.

LAB 1 Innovation & Design Lab <i>Students learn how to think like creators, not just builders</i>	LAB 2 Entrepreneurship & Startup Lab <i>Students learn how to present, sell, and validate ideas</i>
LAB 3 Creative Media & Digital Expression Lab <i>Students improve creativity, design, and communication skills</i>	LAB 4 Life Skills & Teamwork Lab <i>Students learn how to work like real teams and leaders</i>

Lab 1 · Innovation & Design Lab

ADD-ON PROGRAM

Focuses on real-world problem solving and product thinking (beyond just building robots).

Modules Covered		5 Focus Areas
#	Focus Area	
01	Identifying real-life problems (school, village, home)	
02	Idea generation & solution thinking	
03	Rapid prototyping (paper, models)	
04	Testing with feedback & improvement	
05	Mini innovation challenge	

 **Outcome:** Students learn how to think like creators, not just builders

Lab 2 · Entrepreneurship & Startup Lab

ADD-ON PROGRAM

Adds a business + real-world mindset to student projects.

Modules Covered		5 Focus Areas
#	Focus Area	
01	Turning ideas into usable products	
02	Basic cost, value, and pricing thinking	
03	Simple business model concept	
04	Pitching ideas confidently	
05	Demo day / presentation	

 **Outcome:** Students learn how to present, sell, and validate ideas

Lab 3 · Creative Media & Digital Expression Lab

ADD-ON PROGRAM

This is your strong arts + modern digital layer (big differentiator).

Modules Covered		5 Focus Areas
#	Focus Area	
01	Poster & visual design for projects	
02	Basic UI/UX thinking (how apps look & feel)	
03	Storytelling with projects	
04	Creating presentations / short videos	
05	Creative coding (animation, storytelling)	

 **Outcome:** Students improve creativity, design, and communication skills

Lab 4 · Life Skills & Teamwork Lab

ADD-ON PROGRAM

Builds real-world skills schools actually care about but rarely teach well.

Modules Covered		5 Focus Areas
#	Focus Area	
01	Team roles and collaboration	
02	Planning & executing projects	
03	Time and task management	
04	Peer feedback & improvement	
05	Final team-based challenge	

 **Outcome:** Students learn how to work like real teams and leaders