FORGEBOT
AI LAB

DETAILED CURRICULUM PLANNER

ForgeBot AI Lab STEM and Robotics Curriculum

Built around hands-on, play-based STEM learning with minimal screen time, regular take-home creations, early 3D printing, and short guided VR spark moments. This page shows the exact class-by-class curriculum flow for each age group.

- Exact class-by-class breakdown
- Weekly structure for each track
- Maker-driven, low-screen-time learning
- Take-home creations built across the term

CURRICULUM OVERVIEW

What this curriculum is designed to build

ForgeBot AI Lab uses hands-on, guided STEM learning so children progress from playful building to structured robotics, coding, design, AI, and invention thinking. The plan below follows the original curriculum structure and shows the exact class flow for each track.

Maker-driven, not scripted

Students experiment, iterate, and build instead of following only rigid step-by-step screen lessons.

Regular take-home creations

Every few classes culminate in a visible project such as a badge, toy, printed part, robot, or showcase artifact.

Early 3D printing and design

From the early stages, children model and print objects so ideas turn into physical creations.

Short VR spark moments

VR is used in brief guided bursts to make concepts tangible, not as the main mode of learning.

AGES 7-9

Explorers

Spark curiosity through play, circuits, motion, creative tools, and early making.

Sample projects

- Glowing LED badges and bracelets
- Spinning and light-up toys
- 3D printed name tags and keychains
- Night-lights and simple sensor gadgets
- Bristle-bots and beginner robot cars

WEEKLY FLOW

How the term is structured

WEEK	CLASS 1	CLASS 2
Week 1	Circuits Basics	Switch and Circuit
Week 2	Motors and Motion	Combine Light and Motion
Week 3	3D Design Intro	3D Printing
Week 4	Finish 3D Project	Light-Up Keepsake
Week 5	Sensor 1 - Light	Sensor 2 - Tilt and Sound
Week 6	Intro to Coding	Make-It-Glow
Week 7	Bristle-Bot Bug	Decorate and Race
Week 8	Line-Follower Bot	Test and Troubleshoot
Week 9	Servos and Steering	Robot Car Build
Week 10	Complete Robot Car	Remote Control
Week 11	Mini-Invention Challenge	Make Your Invention
Week 12	Rehearsal	Showcase Day

DETAILED CLASS PLANNER

Exact class-by-class breakdown

CLASS 01 — Week 1

Circuits Basics

Focus: Children discover how a battery powers an LED and learn the idea of a complete circuit.

What students do: Build and decorate a first glowing badge using a coin cell, LED, and simple conductive connections.

Key tools: LED, coin battery, copper tape, cardboard, markers

Take-home outcome: A glowing LED badge and a first success with electricity.

CLASS 02 — Week 1

Switch and Circuit

Focus: Learners understand how opening and closing a switch controls the flow of electricity.

What students do: Add an on-off switch to the badge and test how the light responds.

Key tools: Badge from Class 1, simple switch, battery, wires

Take-home outcome: A working badge with switch control.

CLASS 03 — Week 2

Motors and Motion

Focus: Children explore how a motor creates movement and turns energy into motion.

What students do: Build a small spinning or vibrating toy using a battery-powered motor.

Key tools: Small DC motor, battery holder, wires, craft materials

Take-home outcome: A motorized toy prototype ready to combine with light in the next class.

CLASS 04

Week 2

Combine Light and Motion

Focus: The class connects multiple components in one playful build.

What students do: Attach an LED to a moving toy base to create a light-up motion project.

Key tools: Motor toy, LED, battery, tape, wires

Take-home outcome: A completed light-up moving toy to take home.

CLASS 05

Week 3

3D Design Intro

Focus: Children learn how basic digital shapes become printable objects.

What students do: Create a name tag or keychain design in a beginner-friendly CAD tool.

Key tools: Computer or tablet, Tinkercad, sketch references

Take-home outcome: A saved 3D design ready for printing.

CLASS 06

Week 3

3D Printing

Focus: Students experience how a 3D printer turns digital design into a physical object.

What students do: Watch the printing process, then remove and clean printed name tags or keychains.

Key tools: 3D printer, PLA filament, printed models

Take-home outcome: A printed part children can hold and personalize.

CLASS 07

Week 4

Finish 3D Project

Focus: This class prepares the printed object for electronics and final finishing.

What students do: Clean the printed part, decorate it, and get it ready for LED integration.

Key tools: Printed tag, sandpaper, craft supplies, LED prep parts

Take-home outcome: A polished project body ready to light up.

CLASS 08

Week 4

Light-Up Keepsake

Focus: Children combine a printed object with simple electronics.

What students do: Insert and wire an LED into the printed keepsake so it lights with a battery and switch.

Key tools: Printed tag, LED, battery, wire, tape or solder support

Take-home outcome: An illuminated 3D printed keepsake.

CLASS 09

Week 5

Sensor 1 - Light

Focus: Learners discover how a light sensor can react to darkness or brightness.

What students do: Build a simple night-light circuit using a photoresistor and LED.

Key tools: Photoresistor, LED, resistor, battery, transistor

Take-home outcome: A night-light gadget that reacts to light conditions.

CLASS 10

Week 5

Sensor 2 - Tilt and Sound

Focus: Children explore how motion or sound can trigger a response in a circuit.

What students do: Create a buzzer, clap-light, or shake-activated build using simple sensor logic.

Key tools: Small motor or vibration switch, buzzer or LED, battery

Take-home outcome: A gadget that responds to shake, tilt, or clap.

CLASS 11 — Week 6

Intro to Coding

Focus: Students begin learning how instructions can control light and behavior.

What students do: Use a block-coding app to sequence LED patterns or simple outputs.

Key tools: Tablet or laptop, block-coding app, starter coding kit

Take-home outcome: A first coding sequence and stronger logic vocabulary.

CLASS 12 — Week 6

Make-It-Glow

Focus: The class connects coding with a real physical output.

What students do: Apply a simple program to make an LED blink in a pattern on hardware.

Key tools: Beginner microcontroller board, LED, USB cable, coding app

Take-home outcome: A coded LED build that connects software to a real output.

CLASS 13 — Week 7

Bristle-Bot Bug

Focus: Children learn how vibration can create motion in a tiny robot.

What students do: Build a bristle-bot from a toothbrush head, motor, and battery.

Key tools: Toothbrush head, toy motor, coin battery, tape, glue

Take-home outcome: A bristle-bot build ready for personalization and racing in the next class.

CLASS 14 — Week 7

Decorate and Race

Focus: Students personalize their robot and test how design affects movement.

What students do: Decorate bristle-bots, compare performance, and run short races.

Key tools: Completed bots, craft supplies, race track setup

Take-home outcome: A finished personalized bristle-bot to take home.

CLASS 15

Week 8

Line-Follower Bot

Focus: Children explore how simple sensors can detect contrast and follow a path.

What students do: Add light sensors to a basic bot and configure it to follow tape lines.

Key tools: Photoresistors, small chassis, Arduino-compatible board, tape track

Take-home outcome: A first line-following robot behavior.

CLASS 16

Week 8

Test and Troubleshoot

Focus: Learners practice tuning and debugging a robot behavior.

What students do: Adjust sensitivity, fix balance issues, and improve line-following performance.

Key tools: Line-following bot, test track, simple coding or wiring controls

Take-home outcome: A better-performing robot and early troubleshooting habits.

CLASS 17

Week 9

Servos and Steering

Focus: Students see how a servo can control precise turning and steering.

What students do: Attach a servo to a simple steering setup and test turning motion.

Key tools: Micro servo, axle or wheel unit, controller, wires

Take-home outcome: A steering mechanism that responds to control input.

CLASS 18

Week 9

Robot Car Build

Focus: The class combines earlier skills into a basic wheeled robot platform.

What students do: Assemble a 2WD robot car with wheels, motors, battery, and steering support.

Key tools: 2WD chassis kit, motors, battery box, wires, axle parts

Take-home outcome: A working robot car platform.

CLASS 19

Week 10

Complete Robot Car

Focus: Children integrate communication and control into the robot car.

What students do: Add an infrared receiver and connect the car to a remote-control workflow.

Key tools: Robot car, IR receiver, remote, microcontroller

Take-home outcome: A more complete robot with responsive control.

CLASS 20

Week 10

Remote Control

Focus: This session helps students practice steering, speed, and wiring refinement.

What students do: Drive the robot, tune the build, and refine how it responds to commands.

Key tools: Completed robot car, IR remote, decoration and tuning materials

Take-home outcome: A decorated, driveable remote-controlled car.

CLASS 21

Week 11

Mini-Invention Challenge

Focus: Children shift from guided projects into early invention thinking.

What students do: Brainstorm a useful gadget, toy, or alarm and sketch a simple plan.

Key tools: Paper, pencils, craft materials, example inspirations

Take-home outcome: A mini invention idea with a simple build plan.

CLASS 22

Week 11

Make Your Invention

Focus: Students turn their idea into a buildable prototype.

What students do: Construct the invention using available circuits, motors, and creative materials.

Key tools: Chosen components, cardboard, simple electronics, craft supplies

Take-home outcome: A working prototype in progress.

CLASS 23

Week 12

Rehearsal

Focus: Children learn to explain what they built and how it works.

What students do: Practice presenting projects, refine details, and prepare displays for parents.

Key tools: Completed builds, display boards, markers

Take-home outcome: A stronger project story and presentation plan.

CLASS 24

Week 12

Showcase Day

Focus: The term ends with a celebration of learning, creativity, and confidence.

What students do: Present projects and portfolios to parents and invited guests.

Key tools: Display tables, projects, portfolios, certificates

Take-home outcome: A final showcase experience and visible sense of achievement.

AGES 10-12

Builders

Move from guided making into microcontrollers, sensors, coding, and structured engineering challenges.

Sample projects

- Obstacle-avoiding robot cars
- Smart night lamps and sensor gadgets
- Phone-controlled IoT builds
- 3D printed functional robot parts
- Prototype challenge projects and beginner AI demos

WEEKLY FLOW

How the term is structured

WEEK	CLASS 1	CLASS 2
Week 1	Advanced Circuits	Introduction to Microcontrollers
Week 2	Digital Logic Basics	Programming Sequences
Week 3	Motors and Gears	Build Buggy
Week 4	Sensors 1 - Distance	Sensors 2 - Light and IR
Week 5	Autonomous Robot Car	Adjust and Improve
Week 6	Introduction to IoT	Web Control
Week 7	3D Printing Functional Part	Assemble 3D Part
Week 8	Project Challenge 1	Begin Prototype
Week 9	Prototype Iteration	Add Complexity
Week 10	AI Introduction	ML Application
Week 11	Finalize Project	Practice Presentation
Week 12	Rehearsal and Reflection	Showcase Day

DETAILED CLASS PLANNER

Exact class-by-class breakdown

CLASS 01

Week 1

Advanced Circuits

Focus: Students move beyond simple kits into breadboards, transistors, and cleaner circuit building.

What students do: Build a blinking LED circuit on a breadboard and understand switching components.

Key tools: Breadboard, LEDs, resistors, transistor, jumper wires

Take-home outcome: A working breadboard circuit and stronger component familiarity.

CLASS 02

Week 1

Introduction to Microcontrollers

Focus: Children learn how code gets uploaded to a real controller board.

What students do: Set up the Arduino environment and upload a basic blink program.

Key tools: Arduino-compatible board, USB cable, LED, resistor

Take-home outcome: A first coded hardware project.

CLASS 03

Week 2

Digital Logic Basics

Focus: Learners begin understanding logic combinations and sensor decisions.

What students do: Explore AND and OR style sensor thinking with simple signal examples.

Key tools: Breadboard, basic sensors, logic examples, controller board

Take-home outcome: A better understanding of conditional behavior in builds.

CLASS 04

Week 2

Programming Sequences

Focus: The class builds confidence with output patterns, timing, and structured code.

What students do: Program LED sequences, buzzer patterns, and timing-based behavior.

Key tools: Controller board, buzzer, LEDs, coding setup

Take-home outcome: A sequenced output program and stronger coding rhythm.

CLASS 05

Week 3

Motors and Gears

Focus: Students explore torque, speed, and how gear design affects robot performance.

What students do: Print or assemble simple gear parts and test different motion setups.

Key tools: 3D printed gears, motor, battery, small mechanism parts

Take-home outcome: A working gear assembly and better mechanical intuition.

CLASS 06

Week 3

Build Buggy

Focus: The class builds a first proper robot chassis with motors and wheels.

What students do: Assemble a buggy frame and test drive the platform before automation is added.

Key tools: 2WD chassis, motors, wheels, motor driver, battery

Take-home outcome: A driveable robot buggy base.

CLASS 07

Week 4

Sensors 1 - Distance

Focus: Children learn how ultrasonic sensing measures space around a robot.

What students do: Mount a distance sensor to the chassis and test range readings.

Key tools: Ultrasonic sensor, robot car, microcontroller, cables

Take-home outcome: A robot platform that can detect obstacles.

CLASS 08

Week 4

Sensors 2 - Light and IR

Focus: Students compare multiple sensor types and how robots react to the environment.

What students do: Use IR or light sensors to trigger responses in the buggy.

Key tools: IR or light sensor modules, buggy, coding setup

Take-home outcome: A sensor-reactive robot behavior.

CLASS 09

Week 5

Autonomous Robot Car

Focus: The robot begins making its own decisions based on sensor input.

What students do: Program the car to turn away from obstacles using conditional logic.

Key tools: Robot car, ultrasonic sensor, controller, motor driver

Take-home outcome: A working obstacle-avoiding robot car.

CLASS 10

Week 5

Adjust and Improve

Focus: This class turns testing into better calibration and more stable robot behavior.

What students do: Tune turning thresholds, speed, and path response through repeated trials.

Key tools: Completed robot car, test course, coding laptop

Take-home outcome: A smoother and more reliable autonomous build.

CLASS 11

Week 6

Introduction to IoT

Focus: Students learn that hardware can connect to Wi-Fi and communicate online.

What students do: Configure a NodeMCU or similar board and connect it to a local wireless network.

Key tools: NodeMCU or ESP board, USB cable, laptop

Take-home outcome: A connected microcontroller setup.

CLASS 12

Week 6

Web Control

Focus: Children see how a phone or browser can control hardware remotely.

What students do: Build a simple web or mobile interface to toggle an LED or control an output.

Key tools: NodeMCU, LED or motor, phone or browser interface

Take-home outcome: A beginner IoT project controlled from a phone or web page.

CLASS 13 — Week 7

3D Printing Functional Part

Focus: The class shifts from decorative prints to practical robot parts.

What students do: Design a small gear, gripper, or housing part for a robot system.

Key tools: CAD tool, 3D printer, PLA filament

Take-home outcome: A custom printed functional part.

CLASS 14 — Week 7

Assemble 3D Part

Focus: Students connect printed parts with moving hardware.

What students do: Mount the printed part onto a servo or robot mechanism and test motion.

Key tools: Printed part, micro servo, controller board, wires

Take-home outcome: A functioning robot mechanism such as a gripper.

CLASS 15 — Week 8

Project Challenge 1

Focus: Children begin moving from guided builds into original problem solving.

What students do: Choose a challenge such as plant monitoring or a water alert system and plan a solution.

Key tools: Chart paper, markers, sample sensors, planning sheets

Take-home outcome: A capstone project idea and component list.

CLASS 16 — Week 8

Begin Prototype

Focus: The class turns plans into the first working version of a solution.

What students do: Assemble circuitry and coding for the first project prototype.

Key tools: Sensors, microcontroller, breadboard, wires

Take-home outcome: A semi-complete working hardware prototype.

CLASS 17 — Week 9

Prototype Iteration

Focus: Students debug, calibrate, and improve their project through testing.

What students do: Check sensor accuracy, troubleshoot code, and refine behavior.

Key tools: Prototype from Class 16, testing setup

Take-home outcome: A more dependable and refined prototype.

CLASS 18 — Week 9

Add Complexity

Focus: The build gains one more feature or layer of functionality.

What students do: Integrate a second sensor, display, or buzzer into the project.

Key tools: Additional sensor, buzzer or LCD, controller board

Take-home outcome: An upgraded device with richer functionality.

CLASS 19 — Week 10

AI Introduction

Focus: Children meet the idea of machine learning through a simple, guided experiment.

What students do: Train a basic model using a kid-friendly machine learning workflow.

Key tools: Computer with webcam or microphone, internet access

Take-home outcome: A first trained model and a beginner understanding of AI workflow.

CLASS 20 — Week 10

ML Application

Focus: The class connects a trained model to a real output or device behavior.

What students do: Apply a trained model to trigger an LED, sound, or smart action on a board.

Key tools: Micro:bit or compatible board, trained model, simple outputs

Take-home outcome: A beginner smart gadget powered by a model.

CLASS 21 — Week 11

Finalize Project

Focus: Students complete the hardware and software needed for a full demonstration.

What students do: Finish assembly, test all features, and prepare the final project flow.

Key tools: Completed capstone build, controller, sensors, finishing materials

Take-home outcome: A demo-ready project.

CLASS 22 — Week 11

Practice Presentation

Focus: Children learn how to explain innovation, not just build it.

What students do: Rehearse describing the problem, the build, and how the project works.

Key tools: Completed project, note cards, display planning

Take-home outcome: A clear presentation structure.

CLASS 23 — Week 12

Rehearsal and Reflection

Focus: The final practice round improves confidence and polish before showcase.

What students do: Run a full rehearsal, gather peer feedback, and refine project displays.

Key tools: Project setup, poster or photo board, reflection prompts

Take-home outcome: A polished showcase setup and stronger confidence.

CLASS 24 — Week 12

Showcase Day

Focus: The term closes with a public presentation of practical STEM work.

What students do: Present projects to parents, answer questions, and share the build journey.

Key tools: Finished project, display boards, portfolio materials

Take-home outcome: A visible portfolio of creations and a real sense of ownership.

AGES 13-16

Innovators

Open-ended problem solving, IoT, AI, design thinking, and invention-focused real-world projects.

Sample projects

- IoT weather stations and plant monitors
- AI-enabled sensing gadgets
- Smart home concepts and mobile control interfaces
- 3D printed mechanical parts for robotics
- Pitch-ready invention prototypes

WEEKLY FLOW

How the term is structured

WEEK	CLASS 1	CLASS 2
Week 1	Design Thinking	Project Planning
Week 2	Advanced Circuits	Programming Refresher
Week 3	Robotics with Purpose	3D Modeling
Week 4	IoT Deep Dive	Mobile Control
Week 5	Machine Learning Intro	AI Integration
Week 6	Final Prototype Build	Testing and Iteration
Week 7	Business Pitch	Preparation
Week 8	VR Visualization	Rehearsal
Week 9	Peer Review	Refinement
Week 10	Event Prep	Showcase Day

Weeks 11-12 can be used for mentor-led deep dives, extended prototype work, or a longer pilot showcase cycle.

DETAILED CLASS PLANNER

Exact class-by-class breakdown

CLASS 01 — Week 1

Design Thinking

Focus: Students begin with real-world problems and think like creators, not just learners.

What students do: Brainstorm social or environmental challenges and choose a meaningful project direction.

Key tools: Research prompts, chart paper, markers

Take-home outcome: A chosen challenge and a clear problem statement.

CLASS 02

Week 1

Project Planning

Focus: The class turns an idea into a realistic invention plan.

What students do: Define goals, sketch solution blocks, assign roles, and map a build timeline.

Key tools: Whiteboard, planning sheets, markers

Take-home outcome: A project blueprint with milestones.

CLASS 03

Week 2

Advanced Circuits

Focus: Learners work with multiple sensor inputs and more complex control logic.

What students do: Build a multi-sensor prototype that reacts to combined conditions such as motion and light.

Key tools: Arduino or Raspberry Pi, multiple sensors, breadboard

Take-home outcome: A multi-sensor circuit prototype.

CLASS 04

Week 2

Programming Refresher

Focus: Students use higher-level code to process input and control outputs more deliberately.

What students do: Write Python or App Inventor logic to display, log, or react to sensor data.

Key tools: Laptop or Raspberry Pi, IDE or app builder

Take-home outcome: Working code that reads and uses sensor values.

CLASS 05

Week 3

Robotics with Purpose

Focus: Mechanical design is connected to a real project need.

What students do: Build or refine a robotic subsystem such as a gripper or wheel assembly for the prototype.

Key tools: Servos, motors, frame parts, hardware tools

Take-home outcome: A functioning mechanical component for the project.

CLASS 06

Week 3

3D Modeling

Focus: Students design practical custom parts that solve a project problem.

What students do: Model and print brackets, gears, or housings that support the invention.

Key tools: CAD software, 3D printer, filament

Take-home outcome: A custom printed part designed for a real use case.

CLASS 07

Week 4

IoT Deep Dive

Focus: The prototype begins communicating with an online system.

What students do: Set up cloud logging and send sensor data to a simple dashboard.

Key tools: NodeMCU or Raspberry Pi, Wi-Fi, cloud dashboard account

Take-home outcome: A live online sensor dashboard.

CLASS 08

Week 4

Mobile Control

Focus: Students create a user-facing way to monitor or control their invention.

What students do: Build a simple mobile or web interface that reads data or triggers actions.

Key tools: MIT App Inventor or web editor, smartphone or laptop

Take-home outcome: A prototype app or control page.

CLASS 09

Week 5

Machine Learning Intro

Focus: Children experience how a simple model is trained from examples.

What students do: Use a beginner ML tool to train a model on two classes such as objects, colors, or sounds.

Key tools: Computer with webcam or microphone, browser-based ML tool

Take-home outcome: A trained model and a clear AI workflow understanding.

CLASS 10

Week 5

AI Integration

Focus: The model becomes part of a real hardware experience.

What students do: Deploy a trained model to a compatible device and connect it to a practical trigger or feedback loop.

Key tools: Raspberry Pi or ML-compatible board, model files, camera or sensor

Take-home outcome: A smart device behavior linked to a trained model.

CLASS 11

Week 6

Final Prototype Build

Focus: Teams assemble the hardware and software into a coherent invention.

What students do: Integrate sensors, code, printed parts, and outputs into one complete device.

Key tools: All project subsystems, tools, connectors, enclosure parts

Take-home outcome: A near-complete invention prototype.

CLASS 12

Week 6

Testing and Iteration

Focus: Students field-test the device and improve reliability through iteration.

What students do: Run scenario-based tests, gather observations, and refine performance.

Key tools: Prototype, test sheets, calibration tools

Take-home outcome: A more stable and practical final build.

CLASS 13

Week 7

Business Pitch

Focus: The project gains a stronger real-world framing and value proposition.

What students do: Identify who benefits, what problem is solved, and how the invention should be explained.

Key tools: Pitch notes, sample presentation references

Take-home outcome: A clearer product story and positioning.

CLASS 14

Week 7

Preparation

Focus: Teams prepare slides, demo steps, and presentation structure.

What students do: Create posters or slides that explain the problem, the system, and the user benefit.

Key tools: Presentation software, poster board, printed visuals

Take-home outcome: A presentation kit ready for rehearsal.

CLASS 15 Week 8

VR Visualization

Focus: A short VR session is used as an inspiration and visualization tool, not the main lesson.

What students do: Explore a relevant engineering or design concept in VR and reflect on what it clarifies.

Key tools: VR headset, prepared scenario

Take-home outcome: A stronger visual understanding of the project space.

CLASS 16 Week 8

Rehearsal

Focus: Students practice presenting their invention clearly and confidently.

What students do: Run a timed presentation and demo sequence with peer questions.

Key tools: Completed project, pitch slides, demo script

Take-home outcome: A more confident and polished delivery.

CLASS 17 Week 9

Peer Review

Focus: The class uses feedback to strengthen both the invention and the presentation.

What students do: Present draft demos to classmates and collect notes on clarity, usefulness, and user experience.

Key tools: Project prototype, peer review forms, feedback prompts

Take-home outcome: Actionable feedback for refinement.

CLASS 18

Week 9

Refinement

Focus: Students improve the project based on real feedback and edge-case thinking.

What students do: Refine hardware, improve UI or response quality, and close final gaps.

Key tools: Project tools, replacement parts, coding setup

Take-home outcome: A stronger final version of the invention.

CLASS 19

Week 10

Event Prep

Focus: The showcase setup is treated like a real demonstration environment.

What students do: Arrange booths, test demos, prepare handouts, and organize the visitor flow.

Key tools: Tables, posters, project kits, handouts

Take-home outcome: A showcase-ready exhibition setup.

CLASS 20

Week 10

Showcase Day

Focus: Students publicly demonstrate what they built and what problem it solves.

What students do: Present the invention to parents and mentors, answer questions, and reflect on learning.

Key tools: Final prototype, posters, presentation materials

Take-home outcome: A complete innovation showcase and a clear future-learning direction.