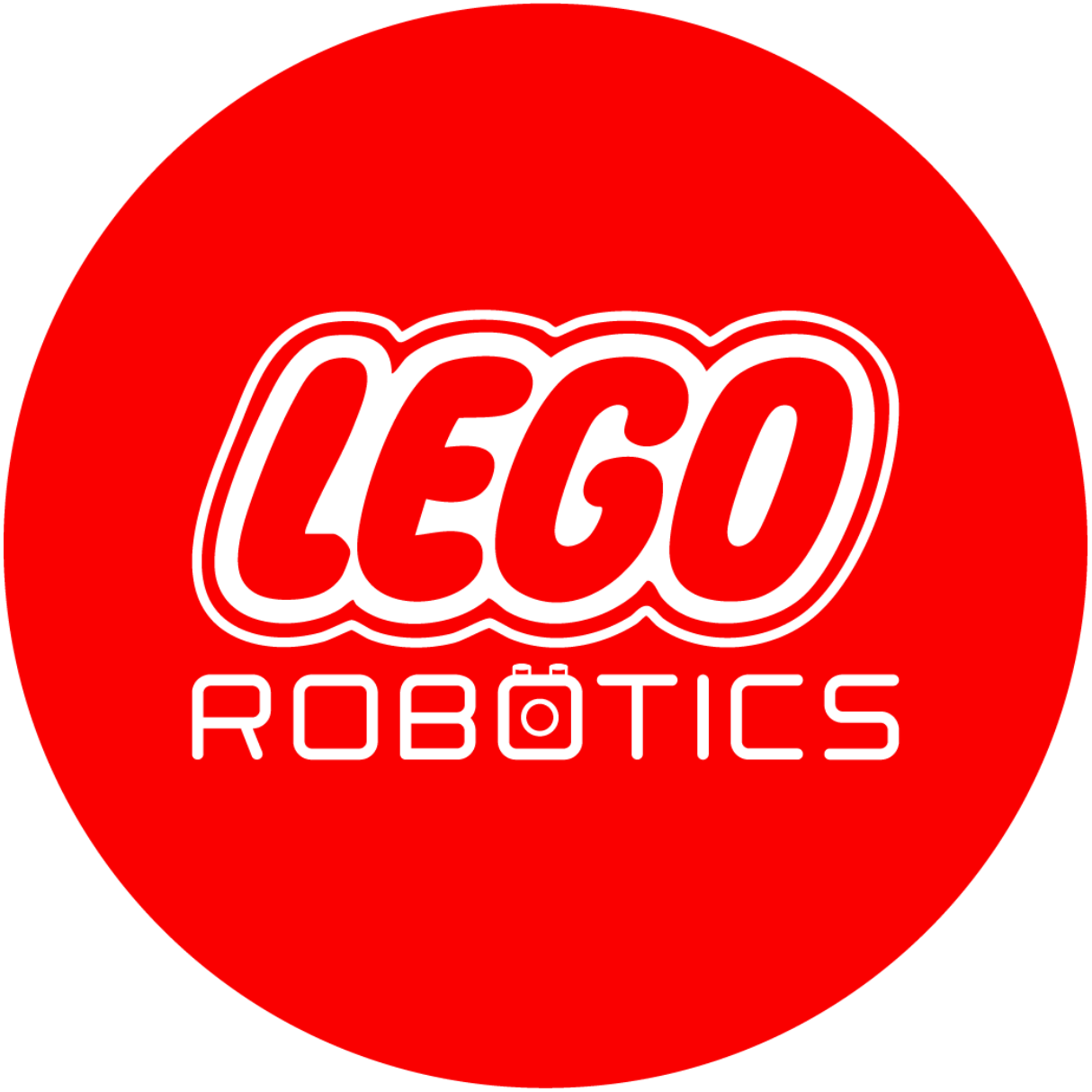

LEGO Robotics: The Innovation Roadmap

From Discovery to Advanced Artificial Intelligence

Organization: CodeCraft Education

Website: www.codecraftedu.com

Target Ages: 6–16+

The Vision of LEGO Education

At **CodeCraft**, we use the LEGO Education ecosystem to turn play into professional skill-building. This roadmap is designed to transition students from basic structural building to high-level Python programming and Machine Learning.

Key Pillars:

- **Tactile Learning:** Physical bricks make abstract code "real."
- **Iterative Design:** Building, testing, and rebuilding.
- **Future Readiness:** Learning the logic used in modern engineering.

Level 1: Early Explorers (Ages 6–8)

Platform: LEGO® Education SPIKE™ Essential

Focus: Mechanical basics and linear logic.

- **Building:** Introduction to gears, axles, and simple stable structures.
- **Coding:** Icon-based coding (drag-and-drop pictures) to create sequences.
- **Key Concept:** "Input → Process → Output." If I press the sensor (Input), the motor spins (Output).

Level 2: Junior Makers (Ages 9–10)

Platform: Transition to SPIKE™ Prime

Focus: Sensor integration and data.

- **Building:** Creating complex attachments and using the "Small Hub."
- **Coding:** Word-block coding (Scratch-based).
- **Key Concept: Conditionals.** "IF the Color Sensor sees Red, THEN Stop. ELSE, Drive Forward."

Level 3: Competition Ready (Ages 10–13)

Platform: FIRST® LEGO® League (FLL) Challenge Sets

Focus: Precision and Strategy.

- **Building:** Competition-grade chassis with "Dog Gears" and modular attachments.
- **Coding:** MyBlocks (creating custom functions) and Gyro-sensor calibration.
- **Key Concept: Reliability.** How to make a robot perform the same task 10 times in a row without error.

Level 4: The Python Bridge (Ages 12–14)

Platform: SPIKE™ Prime with Python API

Focus: Transitioning from Blocks to Text.

- **Building:** Advanced mechanical engineering (Rack and Pinion, Differential gears).
- **Coding:** Writing actual syntax in Python to control the SPIKE Hub.
- **Key Concept: Syntax and Logic.** Understanding indentation, variables, and libraries.

Level 5: AI & Machine Learning (Ages 14+)

Platform: LEGO® SMART Play™ (2026 Edition) / Raspberry Pi Integration

Focus: Artificial Intelligence.

- **Building:** Integrating external cameras and processors with LEGO hardware.
- **Coding:** Using Python for **Computer Vision** (identifying objects by shape, not just color).
- **Key Concept: Neural Networks.** Training a robot to navigate a maze using data patterns.

Hardware Deep Dive: The Sensors

The "Eyes and Ears" of the Roadmap:

1. **Color Sensor:** Distinguishes 8 colors and measures ambient light.
2. **Distance Sensor:** Uses ultrasonic waves to "see" objects up to 200cm away.
3. **Force Sensor:** Measures pressure (in Newtons) and detects "taps."
4. **Gyro Sensor:** Built into the Hub to track rotation and tilt.

The CodeCraft Advantage

Why follow the roadmap with us?

- **Certified Mentors:** Experts in both LEGO Education and Computer Science.
- **Small Class Sizes:** Ensuring every student gets "hands-on-bricks" time.
- **Modern Lab:** Access to the latest 2026 hardware and AI kits.
- **Global Community:** Opportunities to compete in international tournaments.

[Page 10] Your Next Step

Start Your Journey Today

Visit www.codecraftedu.com to find the right level for your child.

- **Free Assessment:** Not sure where you fit? Take our "Level Up" quiz online.
- **Contact:** programs@codecraftedu.com
- **Location:** [Your Local Address Here]

"Building the thinkers of tomorrow, one brick at a time."

LEGO Robotics

LEARNING ROADMAP

1 Explore
Play & Discover

2 Build & Code
Create & Program

3 Challenge
Solve Missions

4 Compete
Join the Team

Curiosity Start

Build & Code

Innovate

Competition Ready