SPIKE ESSENTIAL + PNEUMATICS

TEACHER: CERTIFIED TRAINER	DURATION: 16 CLASSES (1 HOUR PER CLASS)	MODE: OFFLINE

It is a hardware and software platform, which consist of construction of model understanding its function and introduction to programming. Also consist of the models functioning on the principal of pneumatics. Students follow the building process step by step using the LEGO instructions. In this they learn about the mechanical designing using various mechanical parts which is used in real life industries like pulley, cam, axle etc. The fun and learning is enhanced when the programming of the models is introduced. Students quickly learn the simple click-and-drag icons to activate a motor, which might also be dependent on a sensor, in a logical and sequential schema. Spike Essential programming platform also allows for mathematical operations and display effects, counter and many more as the level gets more advance. In pneumatics students learn how to make machines work mechanically with renewable source of energy using pump, piston, cylinder, airtank, monometer ,valve etc.

LEGO Spike Essential

Spike Essential teaches basic robotics and coding through hands-on activities. The kit features:

- Motors, Wheels, Axles, Pulleys, and Beams: Used to build simple robotic models.
- 2 Ports: Connect motors and sensors for interactive functionality.
- Color Sensor: Detects colors and light intensity, triggering specific actions.
- Light Matrix: A 3x3 LED display on the hub, providing visual feedback with patterns or messages.
- STEM Learning Focus: Students learn about motion, force, and simple engineering concepts while using block-based coding to control their creations.

LEGO Pneumatics

LEGO Pneumatics focuses on fluid mechanics and pressure-based systems. It introduces:

- Air Pumps and Cylinders: Demonstrate how compressed air is used to create motion.
- Valves and Tubes: Control the flow of air and regulate movement in mechanical models.
- Pressure Gauges: Teach students to measure and control air pressure for stability.

COURSE CURRICULUM

Spike Essential kits include:

- 2 Ports:
  Used for connecting motors and sensors, enabling the robot to interact with its environment.
- Color Sensor:
  Detects specific colors and measures light intensity to trigger actions in the robot.
- Light Matrix:
  A 3x3 LED display on the hub that provides visual feedback, such as patterns, numbers, or animated sequences.

Mechanical Parts

- Motors:
  Provide power to move wheels or drive other mechanical components.
  Can be controlled to rotate for specific speeds, angles, or durations.
- Pulleys:
  Used to transfer force across a distance via belts, providing mechanical advantage.
  Essential for creating cranes or lifts in mechanical models.

- Wheels and Axles:
  Wheels help the robot move smoothly, while axles transmit rotation between motors and wheels.
  Wheels allow for rectilinear motion and are critical in vehicle-based models.
- Gears:
  Transfer rotational motion and adjust speed or torque using gear ratios.
  Used in robotic models for movement control and precise mechanical motion.
- Beams and Connectors:
  Provide structural support, creating a sturdy frame for the robotic models.
  Connect other mechanical components like motors, pulleys, and axles.

Programming Blocks

1. Motor Blocks
   - Start Motor: Activates a motor at a given speed or direction.
   - Stop Motor: Instantly halts the motor.
   - Set Speed: Adjusts the speed of the motor.
   - Move for Rotations/Seconds: Runs the motor for a specified duration or number of rotations.

2. Light Blocks
   - Set Light Color: Changes the color of the hub's light matrix.
   - Blink Light: Flashes the LEDs on the HUB.

3. Sound Blocks
   - Play Sound: Plays a pre-loaded sound from the hub.
   - Play Note: Emits musical notes for a defined duration.

4. Event Blocks
   - When Program Starts: Marks the start of a program.
   - When Button Pressed: Waits for button input to trigger actions.
   - When Tilted: Detects tilting of the hub and responds.

5. Control Blocks
   - Wait For: Pauses program execution until a condition is met.
   - Repeat Loop: Repeats code for a specified number of times.
   - Forever Loop: Continuously executes code.
   - If-Else: Runs one of two code paths based on a condition.

6. Sensor Blocks
   - Color Sensor: Detects colors and light intensity.
   - Hub Tilt Sensor: Tracks the hub's tilt and orientation.