📅 **Date:**	**Topic: Wireless Controller**	**Time Required: 45 minutes**

🎯 **Learning Target/Objectives:**
- **I can** successfully pair a wireless controller with a robotic arm by following a technical hardware sequence.

- **I can** distinguish between and switch between Action Group Mode and Single Servo Mode to execute specific robotic tasks.

- **I can** troubleshoot connection failures and manage energy constraints like "Sleep Mode" in a wireless system.

📜 **Vocabulary:**

- **Receiver**

- **Pairing**

- **Action Group Mode**

- **Single Servo Mode**

- **Combination Key**

- **Sleep Mode**

❓ **Guiding Questions:**

- Why does a robot require a "receiver" plugged into its board rather than just having a built-in sensor?

- What are the advantages of using "Action Group Mode" for repetitive industrial tasks versus using "Single Servo Mode"?

- How does the "Sleep Mode" timer contribute to the sustainability and efficiency of the robotic system?

📚 **Lesson Design Details:**
- **Activity 1: The Pairing Protocol Race**
  - **Focus:** Students compete in teams to successfully pair their controller. They must document the LED states from "Flashing" to "Steady On".

- **Activity 2: The Action Group Mystery**
  - **Focus:** In Action Group Mode, students press buttons (Up, Down, L1, R1) and must describe the "physical job" the robot is performing for each number (e.g., "Grip to right").

- **Activity 3: Precision Manual Pilot**
  - **Focus:** Students switch to Single Servo Mode and must navigate the arm to touch a specific target using only manual servo controls.

Key Points (Vocabulary):

- **Receiver:** The hardware component that plugs into the robot board to capture signals from the wireless controller.

- **Pairing:** The process of establishing a dedicated communication link between the controller and the robot.

- **Action Group Mode:** A pre-programmed mode where a single button press executes a complex sequence of movements.

- **Single Servo Mode:** A manual control mode where buttons rotate individual motors one at a time.

- **Combination Key:** Pressing two or more buttons (like Select and Start) in a specific order to trigger a hidden function or mode change.

- **Sleep Mode:** A power-saving state the controller enters after periods of inactivity to preserve battery life.

Key Points of Instruction

- **Polarity Awareness:** Remind students that inserting AAA batteries incorrectly (ignoring positive and negative poles) can prevent the controller from powering on.

- **Visual Status Cues:** Teach students to look for "Steady On" LEDs. If lights are flashing, the pairing is incomplete.

- **The "Mode" Toggle:** If students only see one color light (red or green) instead of both, they must use the "MODE" key to fix the status.

- **Combination Logic:** Mode switching requires a specific rhythm: press and hold "SELECT" first, then tap "START".

Teacher's Cheat Sheet	
Feature	**Data / Instruction**
Batteries	2 pieces of AAA (Self-prepared)
Pairing Status	Red and Green LEDs = Steady On
Sleep Mode (Unconnected)	Activates after 30 seconds
Sleep Mode (Connected)	Activates after 5 minutes of no use

Wake Up Command	Press "START" key
Mode Switch Sound	Listen for a "Beep" sound
Switch Sequence	SELECT (Hold) then START
Reset/Initial Stance	Press "START" once in Action Group Mode

Category	Standard Organization	Standard/Benchmark Code and Description
Technology	ITEEA	STEL-2R: Follow step-by-step instructions to safely use systems and troubleshoot common problems
Computer Science	NCSOS	HS-CS-02: Design and implement strategies for troubleshooting hardware and software problems
Engineering	ITEEA	STEL-3H: Optimize a system by identifying and managing various constraints
Digital Literacy	ISTE	1.1 Empowered Learner: Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals
Science	NCSOS	PHY.2.2.3: Analyze the relationship between components in a DC circuit, such as batteries and poles