Lesson Planning Template **Teacher: DeSIRE**

📆Date:	Topic: Mouse Control	Time Required: 45 minutes

🎯**Learning Target/Objectives:**

- **I can** explain how a controller board analyzes peripheral input and processes data through a single-chip microcomputer.
- **I can** successfully interface a standard USB mouse with a robotic controller by managing hardware port constraints .
- **I can** execute precise 6-axis movements by mastering the combination of button clicks and directional mouse movements.

📜**Vocabulary:**

- **Single-Chip Microcomputer**
- **SPI (Serial Peripheral Interface)**
- **Peripheral Device**
- **Analyze**
- **Scroll Wheel**
- **Automatic Pairing**

❓**Guiding Questions:**

- How does the control board turn the physical "sliding" motion of a mouse into a specific "rotational" movement for a servo ?
- Why must the wireless remote receiver be removed before the mouse can function with the xArm 1S?
- In what real-world scenarios (like surgery or manufacturing) might a mouse-style interface be better or worse than a traditional joystick?

📚**Lesson Design Details:**

- **Activity 1: The Input-Process-Output (IPO) Diagram**
  - **Focus:** Students create a visual map showing how a physical mouse click travels through SPI to the microcomputer and finally to a specific servo .
- **Activity 2: The Multi-Axis Coordination Challenge**
  - **Focus:** Students must move an object from one point to another using only the mouse. This requires switching between "Button + Move" and "Simple Move" commands.
- **Activity 3: Peripheral Troubleshooting Lab**
  - **Focus:** Students test different types of mice (optical, laser, wireless with USB dongle) to see which the xArm 1S "automatically pairs" with most effectively.

Key Points (Vocabulary):

- **Single-Chip Microcomputer:** The "brain" of the control board that processes incoming data to move the servos.
- **SPI (Serial Peripheral Interface):** The communication protocol used to transfer mouse action data to the microcomputer for processing.
- **Peripheral Device:** An external device, like a mouse, that provides input for the computer or robotic system.
- **Analyze:** The process the control board uses to break down mouse movements into data the robot can understand.
- **Scroll Wheel:** The middle wheel on a mouse used here specifically to control the No. 1 servo (gripper).
- **Automatic Pairing:** The sequence where the robot identifies and connects to the mouse hardware without manual software setup .

Key Points of Instruction

- **Hardware Conflict Management:** Ensure students remove any existing wireless receivers before plugging in the mouse to prevent data collisions.
- **The SPI Pipeline:** Briefly explain that the board is "analyzing" the mouse's X and Y coordinates and the wheel's rotation, then sending that information through the SPI protocol.
- **Combo Control:** Emphasize that Servos No. 2, No. 3, and No. 4 require holding a button **while** moving the mouse. Moving the mouse alone will only trigger Servos No. 5 or No. 6.
- **Wait for the Handshake:** After powering on, students must wait a few seconds for the "automatic pairing" to complete before the robot will respond .

Teacher's Cheat Sheet

Mouse Action	Robot Result	Targeted Servo
Roll Scroll Wheel	**Open/Close Gripper**	**No. 1**
Left Click + Move Left/Right	Rotate Wrist	No. 2
Right Click + Move Up/Down	Arm Segment 1	No. 3
Left Click + Move Up/Down	Arm Segment 2	No. 4

Move Up/Down (No Click)	Arm Elevation	No. 5
Move Left/Right (No Click)	Base Rotation	No. 6

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-03: Illustrate the ways computing systems implement logic, input, and output through hardware components
Engineering	ITEEA	STEL-2V: Analyze the stability of a technological system and how it is influenced by components in the feedback loop.
Computer Science	NCSOS	HS-AP-12: Use and adapt classic algorithms to solve computational problems
Digital Literacy	ISTE	1.1 Empowered Learner: Students leverage technology to achieve and demonstrate competency in their learning goals