PLC Thesis Lab Setup & Ladder Logic Guide

1. Concept — Automatic Water Tank Level Control System

Objective: Design and implement an automatic water level monitoring and pump control system using a PLC (or PLC-like controller) and sensors. It uses three sensors to detect water level (low, mid, high) and controls a pump automatically based on tank level. A manual override switch allows for manual testing.

2. Hardware Setup (Budget Lab Sketch)

Recommended components and approximate prices:

Component	Description	Approx. Price (USD)
ESP32 board (or Arduino UNO)	Controller	5–10
4-Channel Relay Module	For controlling pump/LEDs	5–8
3x Float sensors / water-level switches	Level detection	5–10
1x Mini pump (12V) or LED	Simulated actuator	5–8
12V Power supply + Breadboard/Wires	Power and connections	10–15
Optional: LCD or web dashboard	For display/monitoring	5–10

Simplified Wiring Diagram (Conceptual)

Water Tank Sensors (High, Mid, Low) → Inputs I0–I2
Manual Switch → Input I3
Pump Relay → Output Q0
Status LED → Output Q1

3. Ladder Logic Example

```
| I2 (LOW_LEVEL) |----[ ]-----------------------------------( )----| M0
(Pump_Enable)
| I0 (HIGH_LEVEL)|----[/]-----------------------------------( )----| M0
(Pump_Enable)
| M0 (Pump_Enable)|----[ ]-----------------------------------( )----| Q0 (Pump
Output)
| I3 (Manual) |----[ ]-----------------------------------( )----| Q0 (Pump Output)
```

Explanation: When the LOW level sensor detects empty, the pump turns ON. When the HIGH level sensor detects full, the pump turns OFF. The manual switch can override the control for testing.

4. Thesis Focus Suggestions

Possible directions for your research:

Focus Area	Example Title / Angle
Basic Control	Design and Implementation of an Automatic Water Tank Level Control System Using Ope
Industrial Cybersecurity	Securing PLC-Based Water Level Control Systems Against Network Intrusions Using Ope
IoT Integration	IoT-Based Real-Time Monitoring of PLC-Controlled Water Tank System Using ESP32 and

Fault Detection	Anomaly Detection in PLC-Based Water Pump Systems via Sensor Data Analytics in Pyth