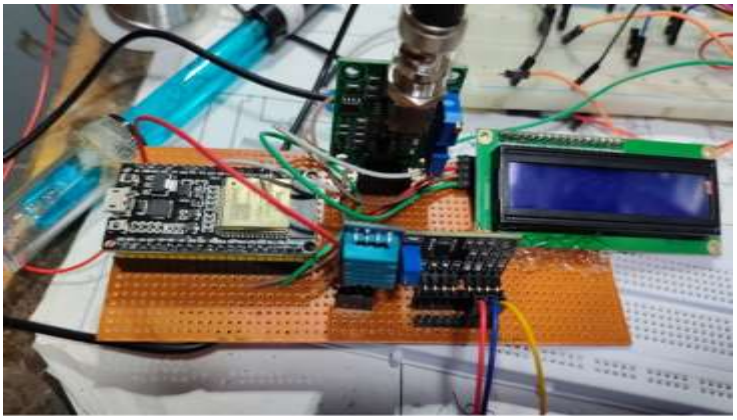
Final Year Design Project Showcase
Batch-2022
Year 2026

	Department: Physics Programme: Physics
1	**Project Title** Designing and Implementation of Smart Water Quality Monitoring System by Using Microcontroller.
2	**Project Idea** An automated, low-cost, and portable solution designed to monitor critical water parameters in real-time. The system continuously tracks variables like pH levels, environmental temperature, and humidity, ensuring data accessibility from anywhere via IoT platforms, thereby replacing slow and manual traditional testing methods.
3	**Process** The prototype utilizes an ESP32 microcontroller as the central processing hub. It interfaces with a pH sensor probe to detect acidity/alkalinity and a DHT11 sensor to log ambient temperature and humidity. The collected data is processed by the ESP32, displayed locally on an LCD screen, and concurrently transmitted via Wi-Fi to a cloud server/dashboard for remote monitoring and analytics.
4	**Outcome** A fully functional hardware prototype capable of accurate, continuous water testing. It successfully demonstrates automated logging of data, immediate visual readouts on the LCD display, and instant remote accessibility, minimizing human error and latency in water safety monitoring.
5	**Evidence (Theoretical Basis)** The project is grounded in electrochemistry (for the potentiometric determination of hydrogen ion activity using the pH probe formula) and semiconductor-based sensor physics (for ambient thermal/humidity tracking). The communication architecture relies on standard TCP/IP wireless protocols for data telemetry via the ESP32.
6	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, This project provides a scalable solution for monitoring water bodies, aquaculture, and domestic supply, which is highly essential for preventing waterborne diseases and managing scarce water resources in the region.
a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region) Attainment of SDG 6 (Clean Water and Sanitation): project provides a scalable solution for monitoring water bodies, aquaculture, and domestic supply, which is highly essential for preventing waterborne diseases and managing scarce water resources in the region.
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)

	Energy-Efficient & Eco-Friendly: Built using low-power microcontrollers and digital sensors that draw minimal current, making it highly feasible to be deployed using portable battery setups or small solar panels.	
c	**Cost Reduction of Existing Product** Cost Reduction of Existing Product: Commercial multi-parameter water monitoring stations are expensive and bulky. This prototype offers a compact, fraction-of-the-cost alternative using open-source hardware components without sacrificing real-time efficiency.	
d	**Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process** (e.g. What is the issue is current process and what improvement you suggests)	
e	**Expanding of Market share** (e.g. how it expand and what is the problem with the current market	
f	**Capture New Market** (e.g. Niche market or unaddressed segment)	
7	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service • Industries: Wastewater treatment plants, agricultural farms, and commercial aquaculture/fish farming. • Communities & Households: Remote areas lacking safe water verification infrastructure. • Academic/Research Groups: Laboratories and students requiring portable data loggers.	
8	**Team Members** (Names along with email address)	1. Syed Areb Ali (PH-22077) - arebsyed13@gmail.com 2. Syed Asad Ali (PH-22063) - asadaliiiii110@gmail.com 3. Muhammad Hamza (PH-22062) - hamza.03.aslam@gmail.com 4. Muhammad Hassam (PH-22082) - hassamqureshi2004@gmail.com
10	**Supervisor Name** (along with email address)	Hafiz Muhammad Usama Ayub (Lecturer, Department of Physics, NEDUET) - Project Advisor Aqeel Ahmed Khan (Senior Scientific Officer, PCSIR) - Co-Advisor
11	**Video (If any)**	NA

Pictures (to be pasted below