

COURSE TITLE: WATER SUPPLY AND DISTRIBUTION

COURSE DESCRIPTION

Water supply and distribution systems are critical engineering networks designed to safely collect, treat, and transport potable water from its source to the end consumer. Efficient distribution relies on rigorous hydraulic design, continuous maintenance, and strategic infrastructure planning to maintain adequate pressure, minimize water losses, and protect public health. This unified section equips utility professionals with end-to-end expertise in managing resilient urban and rural water networks. The field integrates high-fidelity hydraulic modeling, proactive operation and maintenance (O&M), and advanced leakage control strategies to drastically reduce Non-Revenue Water (NRW). It bridges civil, mechanical, and electrical engineering by covering sustainable groundwater extraction, climate-resilient infrastructure planning, and strict occupational safety. By incorporating spatial mapping (GIS) and real-time remote telemetry (SCADA), this program empowers utilities to transition into data-driven, highly efficient, and adaptive organizations.

About This Course

Below are the trainings aligned with this course category, along with their respective modules. These have been designed to systematically address the outlined objectives and enhance participant capacity.

<i>Training 1</i>	<i>Design of Water Supply Distribution System using EPANET and WaterCAD.</i>
Module 1: Hydraulic Modeling & Network Topology (EPANET & WaterCAD interface navigation, data input and node/link mapping, baseline model building).	
Module 2: Simulation & System Optimization (Steady-state vs. 24-hour EPS, pump performance and system head curves, storage tank sizing, demand pattern configuration, and pressure fluctuation analysis).	
Objectives	
<ul style="list-style-type: none">• Design and simulate highly efficient water distribution networks utilizing industry-standard hydraulic modeling software such as EPANET and WaterCAD.• Optimize pump performance curves, and system pressures to ensure a reliable and continuous urban water supply.• Monitor and manage critical system parameters, including pressure fluctuations and demand pattern configurations, to ensure reliable distribution.	
<i>Training 2</i>	<i>O&M of Water Supply and Sewerage Systems: Challenges and Solutions</i>
Module 1: O&M for Pressurized Water Networks (Maintenance scheduling, valve exercising, hydrant flushing, spare parts inventory, troubleshooting leak detection, pressure drops, and pipe bursts).	
Module 2: Water Pumping Station Operations (O&M of tubewells, clean water lift stations, pump efficiency monitoring, electrical/mechanical component checks, and real-time complaint handling).	
Objectives	
<ul style="list-style-type: none">• Implement proactive operation and maintenance (O&M) protocols to efficiently resolve hydraulic failures, pressure drops, and pipe bursts within pressurized clean water networks.	

<i>Training 3</i>	<i>Non-Revenue Water Reduction, Leakage Detection & Control, Hydraulic Testing for Water Supply & Sewerage Systems: Effective Water Meter Selection, Installation, and Management</i>
<p>Module 1: Non-Revenue Water (NRW) Frameworks (Utility water audits, real vs. apparent losses, DMA establishment, active leakage control using acoustic devices and correlators, step-testing protocols).</p> <p>Module 2: Smart Metering & Hydraulic Testing (Pressure testing for pipelines, flow/pressure data interpretation, sewer anomaly identification, smart meter selection, tamper-proof installation, and multicriteria decision-making for optimum water meter selection).</p>	
<p>Objectives</p> <ul style="list-style-type: none"> • Execute active leakage detection and control strategies using acoustic correlators and hydraulic pressure testing to minimize physical water losses. • Conduct comprehensive utility water audits and establish District Metered Areas (DMAs) to significantly reduce Non-Revenue Water (NRW). • Select, install, and manage smart water metering systems to optimize revenue recovery and track commercial water usage accurately. 	
<i>Training 4</i>	<i>Tubewell Design and Installation: Hydrological, Electrical & Mechanical Considerations.</i>
<p>Module 1: Aquifer Hydrology & Well Siting (Aquifer mapping, yield testing, resistivity surveys, specific capacity, and safe yield calculations).</p> <p>Module 2: Mechanical Drilling & Development (Rotary vs. percussion drilling methods, casing/screen selection, gravel packing, and chemical well development).</p>	
<p>Objectives</p> <ul style="list-style-type: none"> • Assess aquifer hydrology and perform resistivity surveys to determine optimal well siting, calculate safe groundwater extraction yields, and design the mechanical well structure. • Design and install high-capacity tubewells by integrating advanced mechanical drilling techniques and precisely sized submersible pumps. • Configure electrical control panels, Variable Frequency Drives (VFDs), and motor sizing to maximize energy efficiency across water pumping stations. 	
<i>Training 5</i>	<i>GIS Mapping & Asset Management for Water & Sanitation and SCADA Systems & IT Interventions for Water Utilities: Enhancing Operational Efficiency and Reliability.</i>
<p>Module 1: GIS Network Digitization & Asset Tracking (GPS field data collection for nodes, pipes, and valves; transitioning from paper to digital pipe inventories; and physical condition assessment grading).</p> <p>Module 2: SCADA Telemetry & Field Operations (Overview of SCADA architecture and RTU/PLC functions at pumping stations, real-time remote monitoring of reservoir levels and pressure fluctuations, and operational alarm systems).</p>	
<p>Objectives</p> <ul style="list-style-type: none"> • Digitize physical pipe networks and track the lifecycle of underground assets through precise GIS spatial mapping. • Integrate SCADA telemetry to establish real-time operational monitoring of reservoir levels, pipe pressure, and pump statuses. 	
<i>Training 6</i>	<i>Climate Resilient WATSAN: Strategies for Water Security, Circular Economy, and Concept of Water Sensitive Cities</i>
<p>Module 1: Climate Resilient Infrastructure & Disaster Risk Reduction (Climate risk assessments, WASH infrastructure vulnerability, DRR strategies, urban-water integration, and resilient stormwater management).</p>	

Module 2: Climate Financing & GHG Emissions in WASH (Mitigating GHG emissions, optimizing energy efficiency in water operations, navigating climate financing frameworks, and PC-I planning integration).	
Objectives	
<ul style="list-style-type: none"> Develop climate-resilient WATSAN strategies by mitigating GHG emissions and integrating disaster risk reduction to mitigate urban flooding and environmental stressors. 	
<i>Training 7</i>	<i>Safeguarding WATSAN Professionals & Staff: Managing Occupational Health and Safety Risks, Hazards, and Best Practices</i>
Module 1: Occupational Safety & Trenching Hazards (General PPE mandates, excavation and trenching safety, identifying physical hazards during high-pressure pipe bursts, and safe handling of heavy civil equipment).	
Module 2: Emergency Response & Traffic Control (Emergency first aid, basic life support, traffic control planning and barricading during street-level pipeline repairs, and standardizing general safety protocols).	
Objectives	
<ul style="list-style-type: none"> Enforce strict Personal Protective Equipment (PPE) mandates and standardize traffic control and excavation safety protocols to protect field operators during pressurized network repairs. Standardize emergency response, first aid, and site decontamination protocols to protect field operators during high-risk water and sanitation operations. 	

Provisions

The following details outline the delivery format, practical tools, and safety equipment provided to support participants throughout this hands-on training module.

Operational Aspect	Details
Mode of Delivery	Face-to-Face, Hands-on Computer Lab, and Field-based Practical Sessions.
Language	English & Urdu.
Teaching Methods	Presentations in addition with activities, group discussions, hands-on exercises, real-time troubleshooting, field-based activities, and team design challenges.
Tools & Equipment	Desktop Computers/Laptops, Projector & Screen, Acoustic Leak Detectors, Acoustic Rods, Metal/Non-Metal Pipe Locators, Manhole Cover Locators, Ultrasonic Flow Meters, Velocity Meters, Pressure Recorders & Gauges, Water Network Model, Sample Water Meters (Rotary, Pulse/Non-Pulse), Water Level Indicators, Power Analyzers, Power/Clamp Meters, Insulation & Earth Testers, Vibration Meters, Panel Model (Star Delta), Portable Gas Monitors, CPR Dummy, Patient Stretcher, and O&M Demonstration Fittings. Personal Protective Equipment (PPE) Includes: Safety Helmets, Safety Shoes, Safety Goggles, Safety Belts, Rain Boots, Safety Gloves, Lab Coats (required for site visits, laboratory work, and field-based exercises).
Residence Facilities	On-campus hostel facilities are available for out-of-station participants attending the training.