



Centre for
Water Informatics
and Technology (WIT)

Spring School on Water Systems, Science & Practice Lahore University of Management Sciences

Module 3: Water Technologies for Quality and Efficiency

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Description

This module will focus on various chemical and electronics-driven technologies to measure and improve the quality and efficiency of water resources. The focus of the module is on the quality of water in surface and groundwater sources, control and treatment of wastewater along with the principles and design of water treatment methods. The module is resolved into four sessions which describe the significance of water, state of the art technology, innovative purification technologies and informatics & electronics technology driven trends in water data acquisition and analysis. The primary focus will be on the water reuse, recycling and treatment processes available globally and locally. The sessions will introduce the participants to the concepts of scientific classification of water based on its various uses to facilitate the ever increasing demand for in-situ water reuse / recycling technologies. The module will include lab tours and live demonstrations on LUMS campus. There will also be a visit to a water treatment and filtration plant near Lahore. The course will serve as a demonstration to gather field information and feedback on water sourcing and quality assurance practices in urban, industrial and agricultural facilities.

Objectives:

Upon completion, the participant should be able to:

1. Understand the global and local trend in available resources of water
2. Understand the role of industrialization in water contamination and related pollution processes in surface, coastal and groundwater.
3. Know the classification of water uses as water recycling management tool.
4. Supervise freshwater quality monitoring and assessment programs under high-tech laboratory and no-laboratory conditions.
5. Learn the use of quality standards and standard operating procedures (SOPs) quality management.



6. Understand alternative technologies for water production and quality management.
7. Able to define criteria how to prioritize economical and efficient processes under project restraints.
8. Learn the basics of data collection and measurements using electronic sensors and systems.

Structure /Outline:

The training sessions includes a series of four interactive sessions, a lab tour and a visit to a water treatment plant. Three sessions consist of core segments surrounding water quality and one on measuring water quantity.

Session 1: Water as Science, Technology and Art for Sustainable Life

Water in our life cycle. Water availability locally and globally. World water consumption trends. A global and local life cycle perspective: untreated water uses, its causes and effects. The need for water conservation, classification and management. Its consequences for utility water, food water that include all forms of water sources, surface (canals, river, seawater) and sub surface (groundwater). A gap between required and acquired technology level.

Session 2: Water quality monitoring & purification technologies

Water monitoring by quantity and quality. Water quality and national and international contaminant standards. Qualitative laboratory methods. Water quality monitoring in a high-tech. laboratory. vs no laboratory conditions. A guided tour to a water testing /or processing unit. A laboratory view training for certain physical (pH, EC, turbidity), chemical (nitrates/nitrites, phosphates, chlorine and lead) and microbiological (total coliforms and TBC) parameters. Writing of standard operating procedures (SOPs). A consumer eye review of available technologies for water desalination, wastewater treatment and water recovery. It includes existing desalination techniques , reverse osmosis , membrane distillation as well as new technologies ,such as nano-filtration , forward osmosis.

Session 3: Water treatment Vs water recovery technologies

An overview of technology from convention to invention. A regional needs analysis. Sourcing water for food. Treatment of surface water to water recovery from processes wastewater. A choice or necessity analysis of available technologies to provide localized and in-situ solution of water scarcity. Water reuse, recycling and recovery technologies. Efficient or economical water recovery.



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Session 4: Water informatics and Smart Infrastructures

The need for ICT driven tools in water management; managing scales of time, geography and expertise with information automation; measurement and control technologies for irrigation delivery; from data analytics to integrated systems analysis

Lab Tour: CYPHYNETS Lab, LUMS

Live demonstrations of canal hydrometry; measuring water in open channels; measuring water in small outlets and drains; imaging water channels using aerial drones.