



WATER SUPPLY ENGINEERING

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IIT Kharagpur

INTENDED AUDIENCE : UG students of Civil Engineering / Environmental Engineering PG students doing specializations in Environmental Engineering / Water Engineering / Urban Planning / Architecture / Infrastructure

INDUSTRIES APPLICABLE TO : Municipal Corporations and Jal Boards of various cities, Public Health Engineering Departments, Companies working in water management sector, such as TCE, L&T, JUSCO, CH2MHill, Veolia Water, Phonix, WABAG, Vulture Innovations, Wipro Infra etc.

COURSE OUTLINE :

Water supply schemes are a basic necessity of every town/city. With growing concerns over managing urban water demands along with resource sustainability, concept of efficient and smart urban water supply systems is progressively getting more pertinent. Incorporating sustainable design and operation principles based on innovative water technologies such as cost-effective treatment solutions, automated supervisory controls, leakage detection and control etc. into water supply systems improves water supply from sustainable perspectives. This course aims to discuss the technical aspects of modern systems for drinking water treatment and distribution in an integrated way. The course will cover topics from traditional aspects of demand calculations and source selections to the up-to-date treatment methods, network design tools etc. The course will also provide insight to smart water supply systems including automation, leakage detection. The financial sustainability of water supply systems and sustainable water pricing models will also be covered.

ABOUT INSTRUCTOR :

Prof. Manoj Kumar Tiwari [Ph.D. (IIT Kanpur)] is a Civil Engg. graduate with specialization in Environmental Engg. and holds expertise in water and wastewater treatment, water distribution systems, water pricing, and contaminant fate and transport. He is a recipient of prestigious Fulbright Fellowship. Prof. Tiwari has co-authored several papers in apex international journals, and has presented his research in various top ranked conferences across the globe. He has over 8 years of teaching experience with both : UG as well as PG level course. He has designed several new courses at IIT Kharagpur for Master's programme in Water Engineering and Management. He has delivered several invited lectures at various organizations, and has also conducted short-term course under Technical Education Quality Improvement Programme (TEQIP) with participants ranging from Faculties and Ph.D. students to field professionals working in government organizations as well as private companies.

COURSE PLAN :

Week 1 : Introduction: General outline of water supply; Water availability and uses; Temporal and spatial distribution; Key issues and concerns; Features and elements of a water distribution systems

Week 2 : Water Demand: Concept of water demand; Estimation of water demand; Factors affecting demand; Components of demand; Demand fluctuations; Demand forecasting; Population forecasting methods

Week 3 : Water Intake: Intake of water; Types of intake; Intake Structures; Conveyance and intake conduits; Free flow and Pressure flow systems; Pumps and their capacity estimation; Economic diameter of water supply pipes

Week 4 : Treatment Philosophy: Storage structures, Reservoir designing, Storage Capacity of Distribution Reservoirs; Mass curve concepts; Design considerations for hourly, daily, weekly and seasonal regulation;

Week 5 : Water Quality and Treatment: Water quality assurance; Water quality standards; Philosophy of treatment; Unit operations and unit processes; Theory and operations of aeration, sedimentation

Week 6 : Conventional Water Treatment: Coagulation and flocculation; Clariflocculation; Filtration: Slow and rapid gravity filter, multi-media filters and pressure filters

Week 7 : Water Treatment: Disinfection and Advanced Treatment: Disinfection through chlorination and other methods; Advanced methods of water treatment; Advanced oxidation processes; Removal of iron and manganese, hardness, fluorides, colour, taste and odour, dissolved metals and gases.

Week 8 : Water Distribution Networks: Water Distribution; Hydraulics of pipe network design; Layouts of Distribution Network; Pipe network analysis; Hardy Cross method

Week 9 : Water Losses and Control: Water-losses in water supply systems; Concepts of NRW and UFW; Apparent and real losses; water loss detection methods; water losses reduction strategies

Week 10 : Advanced Water Distribution Design Approaches: Sectorization of distribution networks; DMA Demarcation; Advantages

and risks; Software for network design (WaterGEMS and EPANET)

Week 11 : Automation in Water Supply: Automation in water supply; Real time monitoring and control; SCADA; Case studies of WTP automation; Automation in distribution systems; Concept of Smart Water Supply System for India cities

Week 12 : Water Economics and Pricing: Economics of water supply systems; Calculation of investments and operational costs; Cost optimization; Approaches of water metering; Water pricing for sustainability; Pricing water in context to Indian cities; Issues and approaches; Existing water pricing models; Case studies