Design and Modelling of Water Distribution Systems

Objectives
The aim of this course is to provide a structured and practical introduction to the design and modelling of water distribution systems based on the textbook “Introduction to Urban Water Distribution” by Dr. Nemanja Trifunovic of UNESCO-IHE Institute in Delft. CPD Delegates will receive a copy of the 500-page book as part of the course. The modelling component of the course will lead the delegate step-by-step through the different capabilities of the public domain hydraulic network software Epanet. Participants will follow the instructors in a hand-on manner on their own laptops, aided by a detailed instruction manual and assignments. The course will start with simple systems consisting of single pipes, and then gradually add complexity, such as pumps, networks, pump stations, time simulation, testing of operational strategies and an introduction to water quality modelling.

Course Content

- Objectives and components of water transport and distribution systems.
- Water Demand: Categories, patterns, calculation, forecasting, modelling.
- Engineering design: Choice of pipe materials, valves and other equipment.
- Pumps: Review of pump types and their applications, design of pumping stations, power requirements and energy consumption, auxiliary equipment.
- Network construction: pipe laying, testing and disinfection.
- Operation and Maintenance: Regular and irregular supply, water losses, network cleaning and rehabilitation procedures, water demand management.
- Asset Management: Optimal maintenance, rehabilitation and replacement scheduling

About the textbook
Focusing primarily on understanding the steady-state hydraulics that form the basis of hydraulic design and computer modelling applied in water distribution, Introduction to Urban Water Distribution elaborates the general principles and practices of water distribution in a straightforward way. The workshop problems and design exercise develop a temporal and spatial perception of the main hydraulic parameters in the system for given layout and demand scenarios. Furthermore, the book contains a detailed discussion of water demand, which is a fundamental element of any network analysis, and principles of network construction, operation, and maintenance. The attached CD contains all spreadsheet applications mentioned in the text, and the network model used in the design exercise. Written in a manner that is easily understood by those who know little about the subject, this introductory text will also benefit experts dealing with advanced problems who wish to refresh their knowledge.

About Epanet
Epanet is software package for hydraulic and water quality modelling of water distribution systems. It was developed by the US Environmental Protection Agency as a research tool and is available free of charge.

Epanet contains a state-of-the-art hydraulic analysis engine, which is used by many commercial hydraulic modelling software packages. It is able to handle different pipe head loss equations, head-dependent demands, minor losses, fixed and variable speed pumps and numerous types of valves. There is no limit on the number of pipes and nodes that a model can handle. Extended period simulations can be performed using time-varying demand and enemy cost patterns and complex control rules can be included in the model.

In addition to hydraulic modelling, Epanet provides various water quality modelling capabilities including water age, blending of water from different sources, loss of chlorine residuals, growth of disinfectant by-products, and tracking of contamination in a system.

Course convener
Dr JE (Kobus) van Zyl holds Bachelor and Master’s degrees in Civil Engineering, and a Diploma in Scientific Computing from the Rand Afrikaans University (now University of Johannesburg). He obtained a Ph.D. in Civil Engineering at the University of Exeter in 2001. He is a registered Professional Engineer, a member of the South African Society of Civil Engineering, American Society of Civil Engineers and the International Water Association, and a Fellow of the Water Institute of Southern Africa. He was Chair of the Department of Civil Engineering Science at the University of Johannesburg (2005 - 2007), and held the Rand Water Chair in Water Utilisation at the same institution. In 1998 Dr van Zyl chaired the 10th Water Distribution System Analysis (WDSA) Conference, held in the Kruger

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National Park. This is one of the two leading international conference series on water distribution systems, and was the first time a WDSA conference was held outside the USA. He has twice been awarded the Best Paper prize in the Journal of the South African Society for Civil Engineering, and is an Associate Editor of the Journal of Water Resources Planning and Management. A/Prof. van Zyl’s research focuses on water distribution systems, and his current interests include hydraulic modelling, stochastic analysis, water losses, metering, and water demand management.

**Who should attend?**
This course will be of benefit to engineering and technical staff at municipalities, bulk water suppliers and consultants who deal with water distribution systems and would like to obtain a solid base of knowledge on best practice in the design and management of water distribution systems. It is also suitable as a refresher course for experienced staff needing to update their knowledge on water distribution systems.

**Format**
This intensive five-day course will introduce delegates to the key aspects of water distribution system design and modelling. Lectures will be presented by the course convenor and selected experts on aspects of water distribution systems. The course is aimed at providing practical knowledge and will include several hands-on calculation, modelling and design exercises.

**Cost**
The fee for the course will be R7900. This fee includes a copy of the textbook and course notes for CPD delegates. Discounts for staff and students of UCT, and students of other tertiary education institutes are available under certain circumstances. Payment details are on the application form.

**Certificates and CPD Points**
A certificate of attendance will be awarded to CPD participants. Participants need to attend 80% of the lectures to qualify for an attendance certificate.

Please note: If you are interested in attending this course for credit purposes, you will need to register for the Masters Programme or as an occasional student. If you attend this course as a CPD participant, credit cannot be claimed in retrospect.

**Venue**
Seminar Room, 3rd floor, New Engineering Building, UCT Upper Campus

**Date and Time**
Daily lectures: 09:00 – 16h30
Monday 19 August – Friday 23 August 2013

**Applications and cancellations**
In order to ensure a place on the course applicants a signed registration form to the course administrators: Heidi Tait or Sandra Jemaar

Confirmation will be sent on receipt of an application form

*Applications close on 12 August 2013. Please note that there is limited space on this course.*

**Cancellations must be received one week before the start of the course, or the full fee will be charged.**

For further enquiries, please contact:
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