DISTRIBUTION SYSTEM WATER QUALITY MODELING

ICYA - 4714

201718

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Classroom: SD 715
Schedule: Wednesday (06-July) – Wednesday (19-July)
Session 1 (09:00 – 12:00) & Session 2 (14:00 – 17:00)

Description

The overall objective of the course is to provide students with the knowledge and background necessary to perform multi-species water quality modeling within drinking water distribution systems. The course will cover topics associated with basic reaction mechanisms, numerical methods typically utilized to solve water quality models, distribution system relevant chemistry, and instruction on developing and implementing distribution system water quality models using the Multi-Species extension of the EPANET modeling framework (EPANET-MSX), both through the command line interface, and through the EPANET Toolkit.

Learning Goals

(A) Skill to apply mathematic, scientific and engineering knowledge.
(B) Skill to design and develop experiments, as well as analyze and interpret data.
(E) Skill to identify, formulate and solve engineering problems.
(K) Skill to use technics, capabilities and modern tools of engineering necessary for the good engineering practice.

Lecture Schedule

Day	Session	Topic
July 06	1	Hydraulics of simple pipes and types of problems
	2	Hydraulics of water distribution networks and design methods (linear theory and gradient method)
July 07	1	Design examples of water distribution networks and EPANET introduction
	2	EPANET examples and exercises
July 10	1	Introduction and background to relevant types of dynamic and equilibrium reactions
	2	Transport and equilibrium modeling
July 11	1	Numerical Considerations: General overview of the available numerical solvers (Euler, RK5, Rosenberg); Coupled vs non-coupled solutions; General

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	2	numerical considerations for selecting and implementing solvers; Practical considerations for the implementation of various solvers; approaches for setting up equilibrium equations
July 12	1	Practical considerations emphasizing general components such as dissolved organic carbon; pH; alkalinity; conductivity; chlorine and chloramine systems
	2	
July 13	1	EPANET Basics: Separation of hydraulics and water quality solvers; water quality solution basics (DVEM and current bulk and wall reaction capabilities) EPANET MSX Basics: Introduction as a generalized water quality solver; generalized problem formulations; inclusion of pipe wall mechanisms
	2	MSX Input File: General structure and format of the input file; Setting up the input file; generating initial conditions
July 14	1	EPANET MSX: interfacing with the toolkit; hydraulic and water quality simulations
	2	Walk through examples of reaction, reaction-equilibrium, reaction-equilibrium-transport examples
July 17	1	Practical exercises about water quality in water distribution networks
	2	
July 18	1	Practical exercises about water quality in water distribution networks
	2	
July 19	1	Practical exercises about water quality in water distribution networks
	2	

Course Evaluation

The evaluation percentages will be as follow:

EPANET Homework	10%
Practical Exercises	30%
Final Project	30%
Final Exam	30%
TOTAL	**100%**

NOTE 1: In case the student considers there is a mistake with his grades, he could make the claim under the dates stipulated by the General Students Regulation.

NOTE 2: Once the due dates for works and projects are set, including the delivery hour, they must be respected. Works delivered late will not be accepted.

NOTE 3: In case a student cannot, with a justified cause, present the exam of the course it will be criteria of the professor if it will be a second exam or the percentage will be redistributed with the other grades of the course.

References

- "Hidráulica de Tuberías. Abastecimiento de Aguas, Redes, Riegos". J. G. Saldarriaga. Editorial Alfaomega. Third edition. Bogotá, 2016.

- "EPANET 2 Users Manual". L. A. Rossman. Editorial EPA. First Edition. Cincinnati, 2000. Available on https://nepis.epa.gov/Adobe/PDF/P1007WWU.pdf

- "Water Distribution Modeling". D. V. Chase, D. A. Savic & T. M. Walski. Editorial Haestad Press. First edition. 2001.