

Water Supply and Distribution

MODULE TITLE	Water Supply and Distribution Management.
LECTURER(S)	Dr Makropoulos and Dr Lesnic
ECTS VALUE	8
PREREQUISITES	None
COREQUISITES	None
DURATION OF MODULE	15 weeks

TOTAL STUDENT STUDY TIME

Overall, the module is expected to involve students in approximately 200 hours of learning: 12 5-hour lectures; 58 hours assignments; 78 hours private study; 4-hour examination.

WEB LINK <http://www.water-msc.org/en/wrem201.htm>

AIMS

This module aims to provide a basic knowledge of classical and contemporary problems in management of water supply and distribution systems for the practising engineer. It also offers gaining practical experience in using water supply and distribution modelling tools.

INTENDED LEARNING OUTCOMES

1. Subject Specific Knowledge, Understanding and Skills

By the end of this module, the students should:

- a) have acquired understanding of water supply and distribution system components, their characteristics and functioning of such systems;
- b) have acquired basic knowledge of water supply and distribution system management problems;
- c) be able to make appropriate and critical use of water supply and distribution modelling and management principles.

2. Core Academic Skills

By the end of this module, the students should:

- a) be able to identify, formulate and analyse a management problem in a given water supply/distribution system;
- b) be able to critically assess research results;
- c) have acquired some practical experience of using water supply/distribution modelling tools.

3. Personal and Key Skills

By the end of this module, the students should have:

- a) improved further the necessary skills for independent learning;
- b) enhanced report and presentation skills;
- c) improved some IT skills.

LEARNING/TEACHING METHODS

Lectures, problem sheets, tutorials.

ASSIGNMENTS

One assessed coursework assignment (4,000 equivalent words including graphs and tables).

Problem sheets and computer based problem solving.

ASSESSMENT

Examination paper (60%), Course work (40%)

3-hour examination, use of notes and books allowed.

2 assignments, on practical application of modelling tools and literature review (40%, 4,000 equivalent words, including graphs and tables).

SYLLABUS PLAN

- 1. Introduction and Module overview:** System anatomy and types, simulation model concept, application of models, brief history
- 2. Water system components:** Pipes, junctions and reservoirs/tanks, pumps and valves
- 3. Water sources:** Surface water: open reservoirs, surface water intakes; Groundwater: wells/boreholes.
- 4. Water treatment:** Principles and practice
- 5. Water Consumption:** Demands, metering, efficiency, water saving schemes: grey water recycling, rain water harvesting.
- 6. Modelling Theory:** Fluid properties, statics & dynamics, energy losses, friction, resistance coefficients, network hydraulics. Moody diagram; Dimensional Analysis; Modelling WDS: Alternative Approaches
- 7. WDS Design:** Design flow, pipe sizing, Hardy-Cross method.
- 8. WDS Pressure:** Pressure management, pumping, low pressure, high pressure during low demand conditions extending the system, new pressure zones, PRVs, fire flows. Pressure Management Overview and Animation
- 9. Assembling a model:** Representation, building, skeletonisation]: & Model Calibration [predicted vs measured, sources of error, approaches. AWWA Calibration Guidelines; EPANET Tutorial 1/3
- 10. Transients:** incl. Water Hammer; EPANET Tutorial 2/3
- 11. Water quality:** Water age, discolouration, too low/high chlorine, etc. and solutions: disinfection, flushing, etc. EPANET Tutorial 3/3
- 12. Performance indicators:** Overview, IWA, WLC methodology. IWA Guidelines; Introduction to Asset Management

INDICATIVE BASIC READING LIST

1. Walski T.M., Chase D.V., Savic D.A., Grayman W., Beckwith S. and Koelle E., *Advanced Water Distribution Modelling and Management*, 2003, Haestad Press, 000-097-141-412-2
2. Rossman L, *Epanet2 Software and User Manual*, 2005, <http://www.epa.gov/ORD/NRMRL/wswrd/epanet.html>

EXTENDED READING LIST

DuChateau P.C., *Advanced Calculus*, 1992, Harper Collins, 000-0-064-67139-9

AUTHORS

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