MODULE TITLE: Modelling Water Distribution Networks		MODULE CODE: CIV 6720
STAFF MEMBER RESPONSIBLE: Prof Joby Boxall	**SEMESTER: Autumn**	**CREDIT: 10**

LEARNING OUTCOMES

On successful completion of this module students will be able to:

1. Comprehensive, systematic understanding and knowledge of the concepts and processes associated with the hydraulic and water quality operation and other performance aspects of water distribution networks
2. Apply computational approaches for hydraulics and water quality simulation of water distribution systems to develop and critically evaluate complex systems and designs
3. Synthesise and interpret multiple information sources for model building and calibration, producing appropriate technical solutions
4. Apply software and critically evaluate solutions in a case study to illustrate and contrast strategies for different operating environments and the often contradictory requirements of water distribution systems, including regulatory standards

SYLLABUS

Introduction
Water industry challenges and the need for network models.

Operation of Distribution Networks
Key components, demand patterns, leakage, customer interuptions, integrated management of components.
Hydraulic concepts and theory.
Details of latest research.

Hydraulic Performance of Distribution Networks
Modelling approaches and pitfalls.
Application of software with callibration and verification.

Water Quality Processes and Modelling Approaches
Water quality concepts and theory.
Demonstrating new techniques for modelling and visualising water quality operation.
Application of software.

Instrumentation
Some developments in instruments for the measurement of water quality in distribution etworks.
Problems associated with calibration and operation.

Discoloration Modelling and Alleviation
Background on water discoloration and new modelling approaches for network flushing.
Details of latest research.

LEARNING HOURS

Lectures	18 hours
Tutorial Classes	4 hours
Private Study including non invigilated assessment	55 hours
Practical Classes	4 hours
Design Projects	18 hours
Assessment	1 hours
Total	**100 hours**

ASSIGNMENTS

1. Laboratory class providing practical experience of hydraulic principles
2. Practical class using modelling software, interactive session to develop and assess students abilities
3. Tutorial sheets providing practise in solving problems and to check the development of knowledge and understanding
4. Course work / modelling study for the rehabilitation of a real leakage control zone to provide for a new housing development, minimisation of leakage and improvement of water quality.
5. 1 hour unseen exam

ASSESSMENT

Item	Learning Outcomes Assessed	% Credit	Submission Date
1 hour Unseen Examination	1, 2, 3	40	Fri Wk15
Project Report	1, 2, 3, 4	60	Fri Wk15

Formative Assessment: Peer and self assesment of laboratory, practical classes and tutorial sheets. Feed back from assessed class test.

Reason for assessment choice: 1. The design project provides the opportunity to apply knowledge, understanding and analytical and cricial evaluation skills and methods in the solution of a technical problem.
2. 1 hour examination to selectively test and explore limitations of understanding, knowledge and analytical methods gained throughout the course.

A threshold pass will be achieved by completing a basic report effectively communicating and providing evidence of work undertaken to meet the aims and objectives specifically set out in the project brief, and minimum levels of achievement in the examination. An excellent performance will be achieved through individual interpretation, project extension and unique analysis based on further reading and research.

HEALTH AND SAFETY MATTERS ADDRESSED

None

RECOMMENDED READING (A-Core Text, B-Secondary Text, C-Peripheral Reading)

A Thomas M. Walski, Donald V. Chase, Dragan A. Savic (2001) *Water distribution modeling*, Waterbury, Conn.:Haestad Press. ISBN: 0965758044

A Twort, A.C., Ratnayaka, D.D. and Brandt, M.J. (2000) *Water Supply: 5th Edition*, Arnold. ISBN: 0340720182

B Nicolson, N. J. (1993) *An Introduction to Drinking Water Quality*, Institution of Water and Environmental Management. ISBN: 187075218x

C Brandon, T. W. (1984) *Water Distribution Systems*, Institution of Water Engineers and Scientist. ISBN: 0901427136