

CE 407 WATER AND WASTEWATER ENGINEERING

Co-ordinator: Professor D. Butler (Room 305), d.butler@imperial.ac.uk

Status: Environmental Elective

Lecturers: Professor D. Butler (Room 305)
Professor N.J.D. Graham (Room 308A)
Professor C. Maksimovic (Room 409)

Structure: 34 lectures, 20 tutorials, 2 site visits.

Links: CE105, CE204, CE311 : Recommended,
CE408 : Recommended/complementary

Aims

Water is an essential domestic and industrial requirement and must be gathered, purified and distributed; after use this same water must again be safely gathered, treated and returned to rivers or to the sea. In addition, stormwater must be safely drained from urban areas. The aim of the module is to introduce students to the water industry, and to the design/analysis of water and wastewater treatment and collection systems.

SYLLABUS

Water Supply (7 lectures, 5 tutorials)

Principles of design of works for the collection and distribution of water supplies, including abstraction, storage, pumping, distribution and network analysis.

Water Treatment (including Quality) (10 lectures, 5 tutorials, 1 Site Visit)

Definition of water quality. Standards. Scientific basis and design of unit processes. Process selection.

Urban drainage (7 lectures, 5 tutorials)

Principles of design of works for the collection and disposal of stormwater and wastewater.

Hydraulics. Storm, foul and combined sewers. Modelling. Stormwater management.

Wastewater Treatment (including Sludge Disposal) (10 lectures, 5 tutorials, 1 Site Visit)

Nature of wastewater. Wastewater quality parameters and effluent quality requirements. Scientific basis and design of unit processes. Process selection. Sludge treatment and disposal.

Coursework and Submission Dates

1. Network design/analysis:

- Learning outcomes: 1/3 or 5/6
- Assessment procedure: mini-project
- Submission dates: Monday, week 15
- Workload: 15 hours
- Relationship to syllabus: Part 1 or part 3

2. Site visit:

- Learning outcomes: 4/8
- Assessment procedure: Critical report of 2 visits
- Submission dates: Friday, week 25
- Workload: 15 hours (including visit)
- Relationship to syllabus: Part 2/4

Assessment

Elements of each of the outcomes will be assessed by examination (60%) and coursework(40%). The written examination is at the end of session; Part IV. Answer 5 from 8 questions in 3 hours.

Recommended Textbooks/Reading

AMERICAN WATER WORKS ASSOCIATION, Water Quality and Treatment (4th Edition), 1990.

BUTLER & DAVIES, Urban Drainage, 2000.

METCALF & EDDY, Wastewater Engineering Treatment, Disposal, Re-use (3rd Edition), 1991.

TEBBUTT, Principles of Water Quality Control (4th Edition), 1992.

TWORT, RATNAYAKA & BRANDT, Water Supply (5th Edition), 2000.

BUTLER & DAVIES, Urban Drainage, 2004

Learning Outcomes

At the end of the module, a student should be able to:

1. estimate domestic and industrial water demand requirements ;
2. evaluate the potential yield of different water sources and undertake reservoir design;
3. design a simple water distribution network;
4. understand and design the principal elements of a water treatment works for various raw water qualities;
5. estimate the quantity and quality of wastewater and stormwater from urban areas;
6. design a simple collection system for wastewater and stormwater;
7. evaluate the various options for stormwater management
8. understand and design the principal elements of a wastewater treatment works to achieve various effluent qualities.