



Dept. of Civil Engineering | Master's Modules | CPD Courses

# Water Quality Engineering

Presented in person at UCT and online.



# Introduction



## The Master's Programme

The primary aim of the M (Eng) and MSc (Eng) specialising in Water Quality Engineering is to produce graduates with the necessary knowledge and skills to engage effectively in theory, design, modelling and operation of biological and chemical wastewater and sludge treatment systems.

The primary objective of the M(Eng) and MSc(Eng) specialising in Water Quality Engineering is to produce engineers and scientists with high-level and in-depth knowledge and understanding of bioprocess engineering so that they can competently and effectively use steady state and dynamic simulation models for the

design and operation of municipal wastewater treatment plants comprising primary treatment, BNR activated sludge, secondary settling tanks, flotation thickening and stabilisation of waste sludge by aerobic and/or anaerobic digestion unit operations in a plant wide integrated way.

Upon completion of this curriculum the modern approach of modelling and simulation to wastewater treatment plant design and operation can be embraced with deeper insight, advanced knowledge, and greater confidence.

## Continuing Professional Development courses

The course is offered to Continuing Professional Development delegates from which a participant can obtain CPD credits. Please note: If you are interested in attending this course for credit purposes towards MSc degree, you will need to formally register for the MSc Programme or as an occasional student. If you attend the course as a CPD participant, credit cannot be claimed in retrospect. A certificate of attendance will be awarded to CPD participants. Participants need to attend 80% of the lectures to qualify for an attendance certificate.

## Who should attend?

The course is best suited for Water and Wastewater Treatment Professionals, including Engineers and Scientists, Consultants, Contractors, Operators, Project managers, City and Public Works Officials, Urban Planners, and other design professionals who deal with issues related to wastewater treatment. A level 8 qualification in Engineering (or science fields related to water) is required.

## Format

This course will be presented in a hybrid format i.e., face-to-face, and online over 5 days. The face-to-face presentations/ lectures will take place in the Postgraduate Seminar Room, level 3, New Engineering Building, upper campus, UCT. Online participants are expected to have computer access with good Wi-Fi or data reception and will be responsible for ensuring they have backup systems during loadshedding. Further information will be available in the week before the course starts.

# CPD Courses

## Non-Sewered Sanitation

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CIV5157Z: 04 – 08 March 2024

This course aims to develop an understanding of: the description of common technological options for non-sewerage sanitation, including the processes for collection, storage and treatment of wastes; the principles behind the selection, design, operation and maintenance of the various non-sewerage sanitation options.

*ECSCA CPD validation number: UCTWQENSS24*

## Urban Hydrology & Modelling Urban Drainage

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CIV5158Z: 15 - 19 April 2024

This course aims to develop and understanding of and includes: an introduction to urban hydrology, modelling urban drainage systems, Sustainable Urban Drainage System (SuDS) and Stormwater harvesting (SWH).

*ECSCA CPD validation number: UCTWQEUHMUD24*

## Advanced Aquatic Chemistry for Water Engineers

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CIV5052Z: 29 April – 03 May 2024

This advanced course in aquatic chemistry covers chemical thermodynamics; acids and bases, activity, pH equilibria of weak acid base systems, titration of acids and bases, reference species; alkalinity acidity and pH, buffering intensity, detailed treatment of the carbonate system; precipitation and dissolution, mixed weak acid systems; application to pH control in anaerobic digester; the nitrogen and sulphur systems; redox equilibrium systems; Pourbaix (pe-pH) diagrams; kinetics of redox reactions.

*ECSCA CPD validation number: UCTWQEAACWE24*

## Waste Treatment Process

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CIV5159Z: 27 – 31 May 2024

This course aims to develop an understanding of water rights in South Africa, characteristics of effluents, water treatment objectives, overview of water treatment processes and technologies, removal of suspended solids and colour through coagulation, flocculation, sedimentation and filtration, disinfection processes, stabilization, water quality standards, interface between the environmental regulation and water use and wastewater discharge, and design principles for water treatment and water re-use.

*ECSCA CPD validation number: UCTWQEWTR24*

# Advanced Introduction to Wastewater Treatment

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CIV5144Z: 05 - 08 August 2024

This course aims to introduce master's level students to modern municipal wastewater treatment from the perspective of it being a water and resource recovery facility (WRRF). Technical but nonspecialist, it can be taken by any postgraduate science and engineering graduate who is admitted to master's level (NQF9). It aims to give instruction on the tests and measurement methods used for design and operation of WWTPs. By following a virtual tour of a modern WWTP, the purpose, principles, processes (physical, chemical, and biological) and performance of the different unit operations involved in primary, secondary and sludge treatment that make up a WRRF are described. This will give qualitative insight into the implications of primary settling, biological N and P removal and different sludge treatment options on WWTP size, power consumption, effluent water quality, energy and phosphorus recovery and operational complexity.

*ECSA CPD validation number: UCTWQEAIWT24*

# Sedimentation in Water and Wastewater Treatment

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CIV5046Z: 19 – 23 August 2024

This advanced course in solid/liquid separation in water and wastewater treatment includes: classes of solids settling; factors affecting settling tanks; column test for water-treatment solids settling characterization; application to sizing settling tanks (classes 1 and 2 settling); effect of flocculation; flux theory and application to sizing wastewater treatment plant settling tanks (classes 3 and 4); measures of activated sludge settleability and relationships between them; comparison of flux theory with other design procedures; computational fluid dynamics modelling of settling tanks; introduction to membrane technology for solid/liquid separation.

*ECSA CPD validation number: UCTWQESWWT24*

# Sewage Sludge Treatment and Biosolids Handling

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CIV5047Z: 09 – 13 September 2024

This advanced course in sewage sludge treatment includes: an introduction to sewage sludge reuse and disposal guidelines in South Africa; characterization of primary and waste activated sludge in the context of mass balances over the entire wastewater treatment plant; sludge thickening with gravity sedimentation and flotation; development and validation of steady state aerobic digestion model for primary and waste activated sludge stabilisation and application to design and analysis including oxygen transfer and sludge thickening considerations; kinetics, stoichiometry and weak acid/base chemistry of anaerobic digestion; development, validation and application of steady state anaerobic digestion model, generation of sludge treatment liquors and the impact of their recirculation on effluent quality, and nutrient (N and P) reduction in sludge treatment liquors; biosolids handling and design principles (conditioning, dewatering, composting, conveyance, storage); resource recovery from sludge and biosolids.

*ECSA CPD validation number: UCTWQESSTBH24*

# Steady State Design of Biological Nutrient Removal Systems

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CIV5048Z: 14 – 18 October 2024

This advanced course in steady state design of biological nutrient removal systems includes: denitrification, development of the steady state nitrification denitrification (ND) model; effect of ND on reactor volume, effluent alkalinity and oxygen demand; the role of readily biodegradable (RB) and slowly biodegradable (SB) organics; denitrification potential; effect of the influent TKN/COD ratio on unaerated mass fraction, N removal and effluent quality; calculation of inter-reactor recycle ratios for design and analysis of pre-, post- and combined denitrification systems. Characteristics of polyphosphate accumulating organisms (PAOs); development and use of biological excess phosphorus removal (BEPR) steady state model; design and analysis of NDBEPR of systems, chemical P precipitation and its effect on BEPR; new developments and novel applications; the impact of membrane solid/liquid separation and external nitrification on NDBEPR system design.

*ECSA CPD validation number: UCTWQEDBNRS24*

# Modelling and Simulation of Wastewater Treatment Systems

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CIV5049: 11 – 15 November 2024

Introduction to the past, present and future of wastewater treatment plant (WWTP) modelling and simulation; introduction to mechanistic, empirical and hybrid WWTP models; comparison of steady state and dynamic simulation approaches to modelling, overview of current simulation models, protocol for inclusion of biological, chemical and physical process stoichiometry and kinetics, inclusion of rapidly occurring speciation reactions for weak acid/base systems, inclusion of interphase transfer processes, protocol for component nomenclature, model evaluation procedures, integrated system-wide modelling, evaluation of model predicted data.

*ECSA CPD validation number: UCTWQEMSWTS24*



# Programme Overview

<b>Programme</b>	Water Quality Engineering
<b>Courses &amp; dates</b>	<p>Non-Sewered Sanitation CIV5157Z: 04 - 08 Mar</p> <p>Urban Hydrology &amp; Modelling Urban Drainage CIV5158Z: 15 - 19 Apr</p> <p>Advanced Aquatic Chemistry for Water Engineers CIV5052Z: 29 April - 03 May</p> <p>Waste Treatment Process CIV5159Z: 27 - 31 May</p> <p>Advanced Introduction to Wastewater Treatment CIV5144Z: 05 - 08 Aug</p> <p>Sedimentation in Water &amp; Wastewater Treatment CIV5046Z: 19 - 23 Aug</p> <p>Sewage Sludge Treatment and Biosolids Handling CIV5047Z: 09 - 13 Sep</p> <p>Steady State Design of Biological Nutrient Removal Systems CIV5048Z: 14 - 18 Oct</p> <p>Modelling &amp; Simulation of Wastewater Treatment Systems CIV5049Z: 11 - 15 Nov</p>
<b>Venue</b>	Post-graduate Seminar Room, Level 3, New Engineering Building <u>and</u> online
<b>CPD</b>	5 CPD points
<b>Participants</b>	Water and Wastewater Treatment Professionals, including Engineers and Scientists, Consultants, Contractors, Operators, Project managers, City and Public Works Officials, Urban Planners, and other design professionals who deal with issues related to wastewater treatment.
<b>Entrance requirements</b>	Level 8 qualification in Engineering (or science fields related to water), which includes Recognition of Prior Learning (RPL) - in the case of RPL the submission of a portfolio (with evidence of professional responsibilities and skills) and referee reports may be required.
<b>Fees</b>	<p>Standard delegate: R16 500</p> <p>UCT student or staff fee: R8 250</p>

# Registration

## Registration and Cancellation

- [Register online](#)
- Registration covers attendance of all sessions of the course and course material.
- Registrations close one week before the start of the course. Confirmation of acceptance will be sent on receipt of a registration form.
- **Cancellations must be received one week before the start of a course, or the full course fee will be charged.**
- For more information on application and registration procedures, please visit our website: [Registration procedures | University of Cape Town \(uct.ac.za\)](#)

## Certificates and CPD Points

- A certificate of attendance will be awarded to CPD participants for each course. Participants need to attend 80% of the lectures to qualify for an attendance certificate.
- According to guidelines set out by the Engineering Council of South Africa, attendance of this course will earn participants points towards Category 1 (Developmental Activities).
- Please note: If you are interested in attending this course for credit purposes, you will need to register for the master's Programme or as an occasional student. If you attend the course as a CPD participant, credit cannot be claimed in retrospect.
- CPD participants can also request a formal university transcript, which will show this course as part of a Professional Development Career.

## Contact details

For more information or details on CPD courses, visit our website or contact us.

<b>Web:</b> <a href="http://www.cpd.uct.ac.za">http://www.cpd.uct.ac.za</a>	
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