



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Chemical Engineering

Sustainable Environment and Water Utilisation Processes

Water Utilisation Engineering

Postgraduate Programme

2024

BEng(Hons)/MEng Water Utilisation Engineering

BSc(Hons)(App.Sci.)/MSc(App.Sci.) Water Utilisation

ABOUT OUR PROGRAMME

As South Africa's economy grows towards that of an industrialised nation, environmental protection and preservation has become extremely important. The programme in Water Utilisation Engineering at the University of Pretoria is formulated to provide human capacity for industry and the public sector and raise awareness about the finite nature of the assimilative capacity of the environment – with specific focus on water. The programme at Honours level provides the theoretical background in Water Utilisation Technology and mastery of the current regulatory framework. Broader open-ended problems are investigated at Master's and Doctoral level in order for our graduates to provide leadership and insight into solutions for emerging water related problems. The new curriculum recognises the integrated nature of the environmental systems; therefore, the current course offerings integrate the major areas in Water and Environmental Engineering, including: Water Reclamation, Advanced Water Treatment Technologies, Sustainable Water Resources Management, Sustainable Sanitation for Rural and Peri-urban communities, Optimisation of the Water-Energy Nexus, Sustainable technologies for Water Quality Monitoring, etc.

POST-GRADUATE PROGRAMMES

Depending on the first degree, students will be able to register for either the **BEng(Hons)**-degree, following after a BEng-degree or equivalent, or for the **BSc(Hons)(App.Sci.)** -degree, following after an alternative first qualification.

Programme structure: The Division has five main focus areas:

- Drinking water quality and treatment processes.
- Biological wastewater treatment.
- Water quality management.
- Industrial water and wastewater treatment.
- Management, treatment and disposal of sludge and industrial waste.

Please note that a Master's-degree can only be registered for on successful completion of the Honours degree. The Master's-degree is obtained based on a research dissertation.

HONOURS DEGREE

In order to obtain the honours degree, four modules of 32 credits each (a total of 128 credits) must be completed.

Three modules are prescribed for the honours degree in Water Utilisation while the fourth is an elective module.

Prescribed modules for BEng(Hons) and for BSc(Hons)(Applied Science) are:

WCW 780/7 - Chemical Water Treatment (1st semester)
WBW 780/7 - Biological Water Treatment (2nd semester)
WQB 780 - Water Quality Management and Research (1st semester)

Elective modules include:

WAI 780/787 – Industrial Waste Engineering (2nd semester)

Other relevant modules, including modules from the Department of Civil Engineering may also be taken after consultation with the Head of Department.

MODULE DESCRIPTIONS

WCW 780/787 Chemical Water Treatment (32 credits) **(1st semester) Lecturer: Prof. S. Tichapondwa**

Drinking water quality criteria and standards. Raw water sources and characteristics. Assessment of treatment requirements.

Basic water chemistry: Acid-base and solubility equilibrium chemistry; Chemistry of the carbonate system.

Conventional drinking water treatment: coagulation-flocculation; sedimentation, flotation; sand filtration; chlorination; chemical stabilisation.

Advanced drinking water treatment: activated carbon adsorption; ozone and ultra-violet disinfection; enhanced coagulation; membrane processes; softening; iron and manganese removal.

Industrial water treatment: chemical precipitation; neutralisation; oxidation-reduction; desalination processes; ion exchange.

Handbooks: Water Quality and Treatment (2011). J.K. Edzwald Ed, AWWA, Sixth Edition, McGraw-Hill.

Handbook for the operation of water treatment works (2006). C.F. Schutte Ed. Water Research Commission.

WQB 780/787 Water Quality Management and Research **(32 credits) (1st semester) Lecturer: Prof E Chirwa**

Water quality parameters: physical, chemical, biological, microbiological; Units of expression; Evaluation of

parameters; Methods of analysis and practical laboratory analyses; Water quality interpretation, evaluation and assessment, water quality guidelines and requirements for domestic, industrial, agricultural, ecological, recreational requirements; Limnology and water quality in rivers and lakes; Surface water modelling; Ground water quality and assessment; Regulatory aspects including all relevant legislation; Integrated environmental management, integrated pollution control; Procedures to assess effluent discharge impacts; and Water quality management, policies and procedures, role of catchment management agencies, and catchment management plans.

Handbooks: Water Quality Assessments (1996), D. Chapman. Chapman & Hall. Principles of Surface Water Quality Modelling and Control (1987). R.V. Thomann and J.A. Mueller. Harper Collins Publisher Inc.

WAI 780/787 Industrial Waste Engineering (32 credits) (2nd semester) Lecturer: Dr. R. Albertus

Identify source materials, physical and chemical properties of waste; Release and transport mechanisms from source to air, groundwater, soil; Primary pathways of contaminants including sorption, volatilisation, biotic and abiotic transformations; Toxicology; absorption, distribution, biochemical transformation, and secretion of chemicals; Acute and chronic toxicity quantification and evaluation of risk; Hazard identification, exposure assessment, toxicity assessment, risk assessment and approaches to hazardous waste minimisation, treatment and disposal; The handling, classification and disposal of hazardous waste; Disposal of waste by landfill; Water monitoring at waste management facilities; The circular economy: Recycling and resource management; Waste prevention, minimisation and optimisation; Waste policy and legislation; National Waste Management Strategy of South Africa; and Landfill design and Monitoring.

Handbook: Hazardous Wastes: Assessment and Remediation (1997). R.J. Watts, A.M. Teel and C.M. Gardner (2nd edition) (2023). Chemistry for Environmental Engineering (2003). C.N. Sawyer, P.L. McCarthy & G.F. Parkin. McGraw-Hill. Handbook of Solid Waste Management (2nd Edition) by George Tchobanoglous and Frank Keith (2002).

WBW 780/787 Biological Water Treatment (32 credits) (2nd semester) Lecturer: Prof E. Chirwa

Composition and characterisation of sewage; Basic design principles of: Simple sewage treatment systems – night soil,

pit latrines, septic tanks; Small scale sewage works – oxidation dams, biological filters and reed beds; Anaerobic digestion; Suspended – and Attached growth processes; Sludge handling and treatment. The module includes training and practice for simulation software for wastewater treatment processes. Compulsory site visit.

Handbook: Wastewater Engineering Treatment and Reuse, 5th Edition (2014). Metcalf and Eddy, Mc Graw Hill Publishers. Unit Operations and Processes in Environmental engineering, 2nd Edition, Reynolds/Richards; PWS Publishing company, ISBN 053494884-7.

MASTER'S DEGREE

The master's degree is obtained by completion of a 128 credit research dissertation CVD 800/807. Note that this can only be done on successful completion of the Honours degree.

ENROLMENT

Admission: All prospective postgraduate students must first obtain admission to the Faculty of Engineering. Application forms are available at Engineering Administration, or via the UP website.

Registration requirements: Please refer to the Faculty of Engineering yearbook and the postgraduate information on the website of the Water Utilisation Division in the Department of Chemical Engineering at: <http://www.up.ac.za/chemeng>.

Registration: All students must register every year. Registration will be on line at www.up.ac.za, click on "My UP LOGIN" to access the portal and then click on the registration link to register.

Other qualifications: Students with qualifications from other South African universities must note General Regulation G.54. Students with qualifications from foreign universities will be judged on merit.

Selection: The Department reserves the right to select prospective students. Selection will be done on the basis of the student's academic record and the available opportunities for postgraduate study in the group.

COURSE FEES & FINANCIAL SUPPORT

Information on course fees can be obtained from Faculty Administration. The University of Pretoria website has all the information regarding bursaries, loans, information for foreign students, etc. Prospective students are encouraged

to visit this website and download the relevant information from: <http://www.up.ac.za>.

Please contact Student Administration:

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(olga.shokane@up.ac.za)

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(roy.mashiloane@up.ac.za)

MORE INFORMATION

To obtain more information on post-graduate study opportunities in Water Utilisation Engineering, kindly contact: Mrs. Elmarie Otto, email elmarie.otto@up.ac.za, Department Chemical Engineering, University of Pretoria, Pretoria.

BLOCK WEEKS FOR 2024

Water Utilisation Engineering: Post Graduate Programme 2024 Lecture room 2-4, Building 2, South Campus			
SEMESTER 1			
	Feb. 12	WCW 780/7	8:00-16:00
	Feb. 13	WCW 780/7	8:00-16:00
	Feb. 15	WQB 780/7	8:00-16:00
	Feb. 16	WQB 780/7	8:00-16:00
Block 2	April 11	WQB 780/7	8:00-16:00
	April 12	WQB 780/7	8:00-16:00
	April 15	WCW 780/7	8:00-16:00
	April 16	WWC 780/7	8:00-16:00
Exam	June 3	WCW 780/7	8:30-12:30
	June 5	WQB 780/7	8:30-12:30
SEMESTER 2			
	July 1	WBW 780/7	8:00-16:00
	July 2	WBW 780/7	8:00-16:00
Block 3	July 3	Site visit – Depending on availability	8:00-16:00
	July 4	WAI 780/7	8:00-16:00
	July 5	WAI 780/7	8:00-16:00
Block 4	Sept 9	WBW 780/7	8:00-16:00
	Sept 10	WBW 780/7	8:00-16:00
	Sept 12	WAI 780/7	8:00-16:00
	Sept 13	WAI 780/7	8:00-16:00
Exam	Nov. 18	WBW 780/7	8:30-12:30
	Nov. 20	WAI 780/7	8:30-12:30

Lectures start at 08h00 and examinations at 08h30.