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SPECIALISED TRAINING FOR

WATER, ENVIRONMENTAL MANAGEMENT AND GEOTECHNICAL

Driving Sustainable Solutions in Water, Environmental, and Geotechnical Systems

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CONTENT

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ABOUT

ENTERPRISES UNIVERSITY OF PRETORIA (ENTERPRISES UP)

Enterprises University of Pretoria (Enterprises UP) is a private company wholly owned by the University of Pretoria. Enterprises UP was established in 2000 in the form of two separate entities; Business Enterprises at the University of Pretoria (Pty) Ltd (BE at UP) focussing on advisory services and commercial research and Continuing Education at the University of Pretoria Trust (CE at UP) offering short courses. In 2016, the various entities were consolidated into one company Enterprises University of Pretoria (Pty) Ltd (Enterprises UP).

We are a proudly Southern-African business entity that since 2016 has conducted work in 117 countries around the world. Closer to home, on an annual basis, we conduct work in Eswatini, Lesotho, Mozambique, Namibia and other countries in Africa. Annually we also receive between 400-500 international delegates that attend our training programmes in South Africa.

Nothing brings us more excitement and joy than living out our vision of being a Business Solutions partner of choice. When engaging our clients and delegates in a classroom and/or workgroup setting, our main purpose is simply to transfer knowledge in an applied manner. We believe that a key outcome of following this approach is that we can infuse decision-making about many issues pertaining to our country's socioeconomic needs.

Annually we deliver in excess of 1000 projects to our diverse client base and in this process, we have become a trusted partner of choice for many private sector companies and public institutions in South Africa, Southern Africa and abroad.

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TRAINING SOLUTIONS AT A GLANCE

Our Training Solutions division promote lifelong learning through a variety of short courses for individuals, organisations, and communities. Our expert-led courses offer flexible, practical, and tailored learning, ranging from public courses to custom corporate and government training helping delegates to enhance skills, advance careers, and meet evolving professional demands. Academic and support staff with marketable expertise are invited to contribute to course development and delivery, ensuring both academic rigor and real-world relevance.

TRAINING OPTIONS

- **Continuing Professional Development (CPD)**
  - Selected short courses designed to enhance professional skills, update knowledge, and support career growth across various disciplines.
- **Credit-Bearing Courses Towards a formal qualification from UP)**
  - Selected courses that carry academic credit and may contribute towards a formal qualification from the University of Pretoria (UP), subject to approval and requirements.
- **In-house (company-specific) or public audiences**
  - Our training can be delivered exclusively for your organisation, addressing your unique challenges, or offered to public participants, creating opportunities for networking and broader learning.
- **Tailor-made training solutions**
  - We design courses to meet the goals and needs of your team or organisation, ensuring the content is relevant, practical, and immediately applicable.
- **Modular programmes, seminars and workshops**
  - Learning can be structured in flexible modules for progressive skill-building, focused seminars for deep dives into specific topics, or interactive workshops that emphasise hands-on practice and engagement.

MODES OF PRESENTATION

- **Online (Synchronous & Asynchronous)**
  - Synchronous: Live online sessions where delegates and lecturers meet in real time for lectures, discussions, and activities.
  - Asynchronous: Self-paced online learning that allows delegates to access training around the clock and complete it at your own pace.
- **Blended**
  - A mix of online learning and contact sessions, combining the flexibility of online study with the engagement and interaction of in-person learning.
- **Contact Sessions**
  - In-person learning opportunities that encourage interaction, networking, and collaboration, allowing delegates to engage, share experiences, and mingle with peers and experts.
- **Distance Education**
  - Flexible learning approach that allows delegates to study remotely. Depending on the course, distance education may include self-paced learning, scheduled online sessions, or limited contact sessions

CERTIFICATION

Earn a certificate by a world-class, top-ranked* university. Receive a certificate of either successful completion or attendance issued by the University of Pretoria

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ABOUT

CUSTOMISED SOLUTIONS

Enterprises University of Pretoria (Enterprises UP) empowers organisations with flexible, custom-designed training solutions across all industries. Drawing on the expertise of all faculties at the University of Pretoria, we deliver skills development programmes that are relevant, practical, and impactful. Whether it is executive workshops, short courses, or full programmes, we adapt to your needs. Training can be delivered through face-to-face sessions at your offices or a venue of your choice, as well as online via synchronised (live) or unsynchronised (self-paced) formats; locally and internationally.

Why entities choose our customised training:

- Customised solutions tailored to your industry and needs
- Multidisciplinary faculty from the University of Pretoria
- Global reach in over 117 countries
- Multi-location delivery across formats
- Return on Learning (ROL) approach to measure impact

CUSTOMISED SOLUTIONS

Research & Consulting

Providing commercial, analytical and consulting services since **2000**

Provided customised training to over **410** clients

Offers short courses in over **140** disciplines across **9** faculties at UP

Offering CPD courses

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Advanced Course in Slope, Seepage and Foundation Analysis

Presented by the Department of Civil Engineering, University of Pretoria

CLICK HERE TO REGISTER

The Advanced Slope, Seepage and Foundation Analysis short course focuses on a range of analytical techniques incorporated in modern commercial software packages used for geotechnical stability analysis of slopes and walls, as well as seepage and consolidation analysis. The emphasis is on methods other than the finite element method (covered in detail in the Theoretical Soil Mechanics course) including an overview of elasticity, upper and lower bound plasticity methods, limit equilibrium methods with a strong focus on slope stability, as well as finite difference solutions for seepage and consolidation analysis. The course comprises part of the taught component of a postgraduate subject, Analytical Soil Mechanics SGS 787, taught as part of the Honours Degree course in Geotechnical Engineering at the University of Pretoria. Postgraduate students registered for the Honours Degree in Geotechnical Engineering are required to attend this course and in addition, successfully complete a series of assignments and pass the examination for Analytical Soil Mechanics SGS 787. There is no formal evaluation of other course attendees.

Learning outcomes

After successfully completing this course, you should:

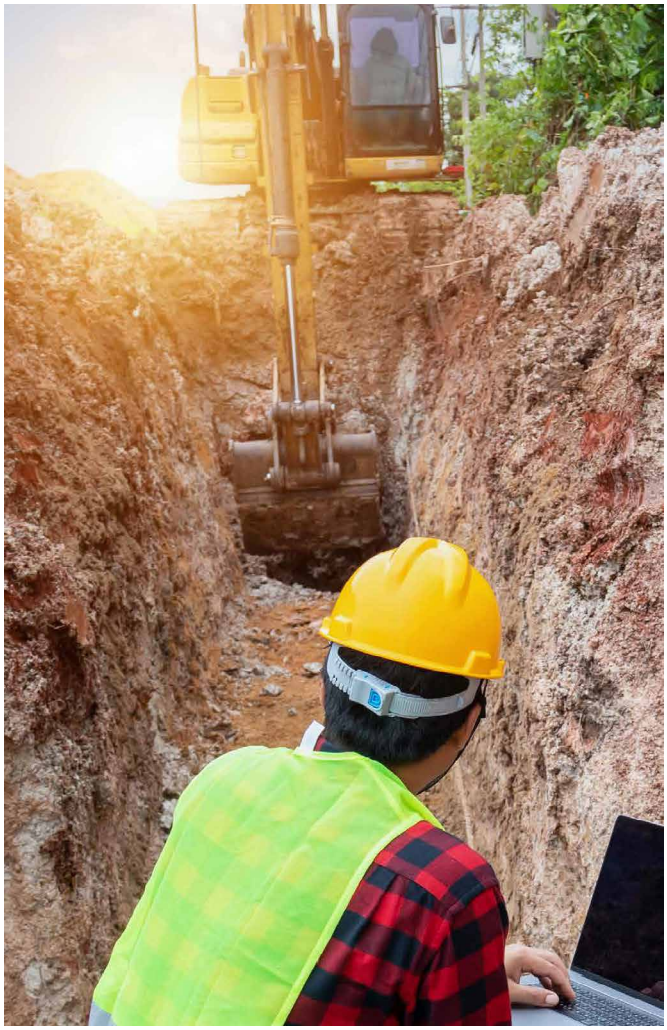
Have a basic understanding of the principles of elasticity which includes knowledge of
- Hook's law
- elastic material parameters
- elasticity in one, two and three dimensions
- isotropy and anisotropy
- plane-strain, radial symmetry and 3D conditions

Have a basic understanding of the principles of plasticity which includes knowledge of
- yield criteria (Mohr-Coulomb, von Mises, Tresca, Drucker Prager)
- associated and non-associated flow rules
- hardening laws (perfectly plastic, strain hardening and strain softening materials)

Have a basic understanding of the principles of plastic limit analysis, i.e.
- the theorems of plastic collapse
- upper bound analysis using plastic mechanisms and virtual work principles
- lower bound analysis using stress discontinuities and stress rotation using Mohr circles
- requirements for an exact solution
- introduction to slip line theory

Have an understanding, and the ability to implement in a spreadsheet, finite difference techniques for the solution of
- consolidation problems
- seepage problems

Have a basic understanding of the principles of limit equilibrium analysis
- understand the principle of limit equilibrium
- be able to solve boundary value problems using limit equilibrium analysis
- know the range of limit equilibrium methods for slope stability analysis incorporated into many software packages and their respective assumptions and shortcomings
- understand the principles of enhanced limit equilibrium analysis using numerical analysis.
- understand the principles of the strength reduction technique for geotechnical stability analysis using numerical analysis.



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Environmental Law

Presented by the Department of Chemical Engineering, University of Pretoria

5 SACNASP CPD Points and 5 ECSA CPD Points

CLICK HERE TO REGISTER

Our innovative Environmental Law short course provides a comprehensive understanding of the rapidly evolving field of environmental law, with a focus on South African legislation. You will explore key topics such as environmental impact assessment, compliance and enforcement mechanisms under the National Environmental Management Act 107 of 1998, biodiversity protection, mining regulations, and the effects of climate change. This course is ideal for legal professionals looking to specialise in environmental law, or for individuals involved in environmental governance or management in either the private or public sector. You will engage with leading experts in the field, equipping yourself with the knowledge and skills necessary to navigate South African environmental law, policies, and case law.

Learning outcomes

By the end of this course, participants will be able to:

- Explain key principles and norms of environmental law and their application in practice.
- Evaluate environmental governance structures and their role in sustainable development.
- Apply environmental impact assessment (EIA) processes to assess and manage development projects.
- Interpret principles of administrative justice and access to information within environmental decision-making.
- Analyse legal frameworks addressing climate change and their implications for policy and practice.
- Assess the legal and regulatory environment governing mining activities.
- Evaluate laws related to biodiversity conservation and the management of protected areas.
- Analyse air quality regulations and their application in environmental management.
- Interpret and apply legal frameworks for waste management and water governance.
- Assess compliance requirements and enforcement mechanisms within environmental law.

Environmental Management and Regulation

Presented by the Department of Chemical Engineering, University of Pretoria

5 SACNASP CPD Points and 5 ECSA CPD Points

CLICK HERE TO REGISTER

The Environmental Management and Regulation short course provides you with essential training in new regulatory developments to better navigate a range of complex issues related to environmental resources and extortion. The course covers a wide range of topics, including both legal and biological aspects of environmental management, ecological frameworks of environmental systems, environmental resource economics and auditing, as well as strategies for waste reduction and disposal and air pollution control. The course provides you with an in-depth review, discussion forum and case studies towards a better understanding of the issues and regulations that are at work to protect the environment.

Learning outcomes

By the end of this course, participants will be able to:

- Interpret the legal frameworks applicable to environmental systems, including ISO 14001 and ISO 9000 standards.
- Apply environmental management practices such as Environmental Impact Management (EIM), Environmental Management Systems (EMS), and Strategic Environmental Assessment (SEA).
- Conduct lifecycle assessments to evaluate environmental impacts across engineering systems.
- Analyse biological and ecological principles relevant to environmental systems and sustainability.
- Apply environmental and natural resource economics to support sustainable decision-making.
- Perform environmental audits to assess compliance and improve organisational performance.
- Apply environmental impact assessment (EIA) processes in project planning and development.
- Develop and evaluate strategies for waste reduction, treatment, and sustainable disposal.
- Assess and implement air pollution control strategies to improve environmental quality.

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Geotechnical Laboratory Testing

Presented by the Department of Civil Engineering, University of Pretoria

1 ECSA CPD Point

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The Geotechnical Laboratory Testing short course is aimed at civil engineering and engineering geology practitioners who want to improve their knowledge on the specification of geotechnical soil tests, interpretation of the data and judgement of the quality of laboratory test results. Laboratory tests that will be dealt with during the course include the triaxial test, shearbox test, oedometer test and Rowe cell test. The application of stress paths to describe the behaviour of soil will be discussed and examples of typical stress paths will be presented. This course comprises part of the taught component of a postgraduate subject, Specialised Geotechnical Testing SGS 789, taught as part of the Honours Degree in Geotechnical Engineering at the University of Pretoria. Postgraduates students registered for the Honours Degree in Geotechnical Engineering are required to attend the course and pass the examination for Specialised Geotechnical Testing SGS 789. There is no formal evaluation of other course attendees.

Learning outcomes

After successfully completing this course, you should:

- be able to specify the appropriate test and drainage conditions for different geotechnical conditions
- be able to identify typical stress paths for different soil types
- understand the importance of instrumentation in the context of laboratory testing of soils
- recognise poor laboratory test data, and
- understand the advantages and limitations of different soil sampling techniques.

In-situ Testing for Geotechnical and Tailings Applications

Presented by the Department of Civil Engineering, University of Pretoria

2 ECSA CPD Points

CLICK HERE TO REGISTER

The In-situ Geotechnical Testing and Tailings Applications short course will refresh your knowledge of in-situ geotechnical testing while also introducing you to new developments in the field. The course focuses on the most widely used tests and applications, including the Standard Penetration Test (SPT), Cone Penetration Test (CPT), Piezocone (CPTu) and seismic tests. During the course, you will also explore the interpretation of test results and its application in geotechnical problems in further detail to expand your knowledge of and skills in the application of each test based on established parameters, as well as direct and indirect test design methods.

Learning outcomes

After successfully completing this course, you should have a thorough understanding of the SPT, CPT, CPTu and seismic tests and their application in geotechnical engineering, including an understanding of standard test procedure for these tests interpretation of these tests to derive basic soil properties to be used in indirect design methods flow and consolidation parameters from the CPTu, as well as the application of these parameters small-strain stiffness and its application understand the application of direct design methods such as those developed by Schmertmann, Schultze and Sherif, as well as Burland and Burbidge have an understanding of the application of the derived parameters in design know how and when to apply N, N1 and (N1)60 be able to derive a complex flow regime from CPTu dissipation data carry out consolidation analysis from derived parameters and the determination of the drainage path from CPTu data carry out interpretation of complete as well as incomplete dissipation tests conduct settlement calculation using small strain stiffness, and have a basic understanding of liquefaction analysis using seismic data. Postgraduates students registered for the Honours Degree in Geotechnical Engineering are required to attend the course and pass the examination for Specialised Geotechnical Testing SGS 789. There is no formal evaluation of other course attendees.

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Introductory course on Geotechnical Design of Tailings Dams

Presented by the Department of Civil Engineering, University of Pretoria

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The Introduction to Geotechnical Design of Tailings Dams is a two-day course focusing on the theoretical framework and practical aspects of assessing the stability of tailings dams in the context of applicable regulatory requirements and industry best practices. The course gives a review of critical state soil mechanics which is fundamental to the appropriate interpretation of the state of the dam. The concepts of drained and undrained shear strength and related slope stability are presented, together with techniques for the appropriate specification and interpretation of laboratory and in situ testing as required for these analyses. The aim of the course is to equip junior geotechnical engineers with the knowledge and framework to understand the complexity of geotechnical design of tailings dams, and to provide techniques and tools to appropriately conduct such designs. The course is presented by the Geotechnical Engineering group at the University of Pretoria, led by the academic group of Prof. Gerhard Heymann, Prof. SW Jacobsz and Dr Talia da Silva Burke. Additional expert presentations ill be given by Prof. Eben Rust and other members of the Geotechnical Engineering group involved with advanced testing and research in tailings.

Learning outcomes

you should have a basic understanding of the fundamental principles of geotechnical design of tailings and the relevant legislative framework including an understanding of:

- Significant local and international tailings dam failures, the fundamental reasons for these failures and impact of each event;
- available documents for international best practice in the design, construction, operation and management of tailings dams;
- relevant local legislation governing the geotechnical design of tailings dams in South Africa;
- critical state soil mechanics, application of the stat parameter to tailings, and the NorSand critical state model;
- drained and undrained shear strength of tailings, including the characterisation of brittle behaviour, and available estimates of peak and residual undrained shear strength ratios;
- appropriate techniques to sample and transport tailings material;
- appropriate specifications and techniques for high- quality laboratory testing and interpretation of results, including triaxial testing for critical state parameters and direct simple shear tests;
- appropriate specifications and techniques for high- quality in situ testing of tailings and interpretation of results; and
- breach (dam break) analysis of tailings.

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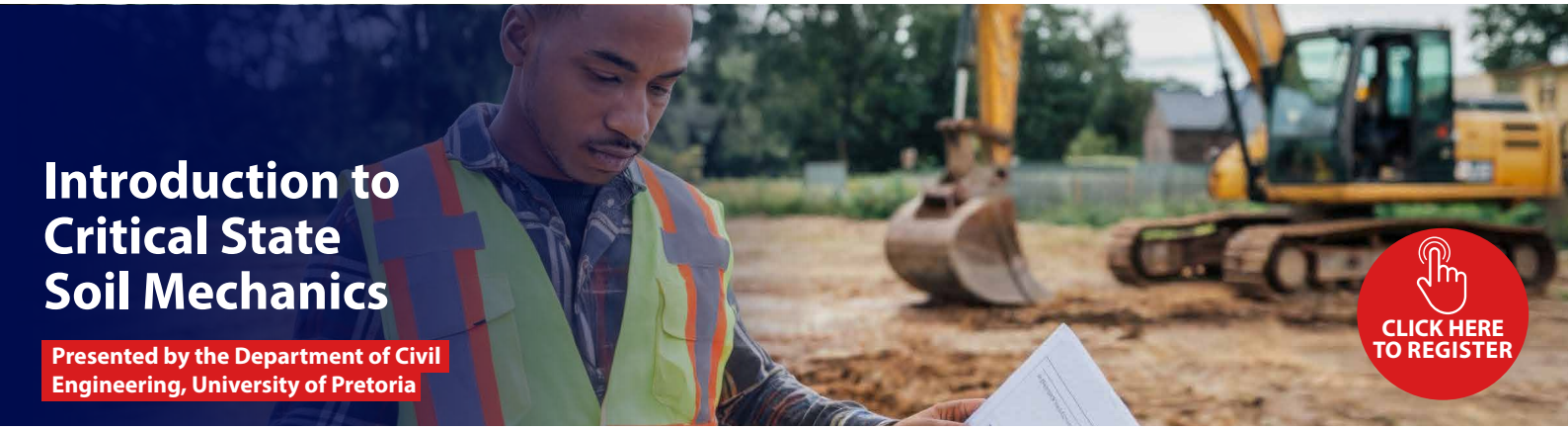


Introduction to Critical State Soil Mechanics

Presented by the Department of Civil Engineering, University of Pretoria

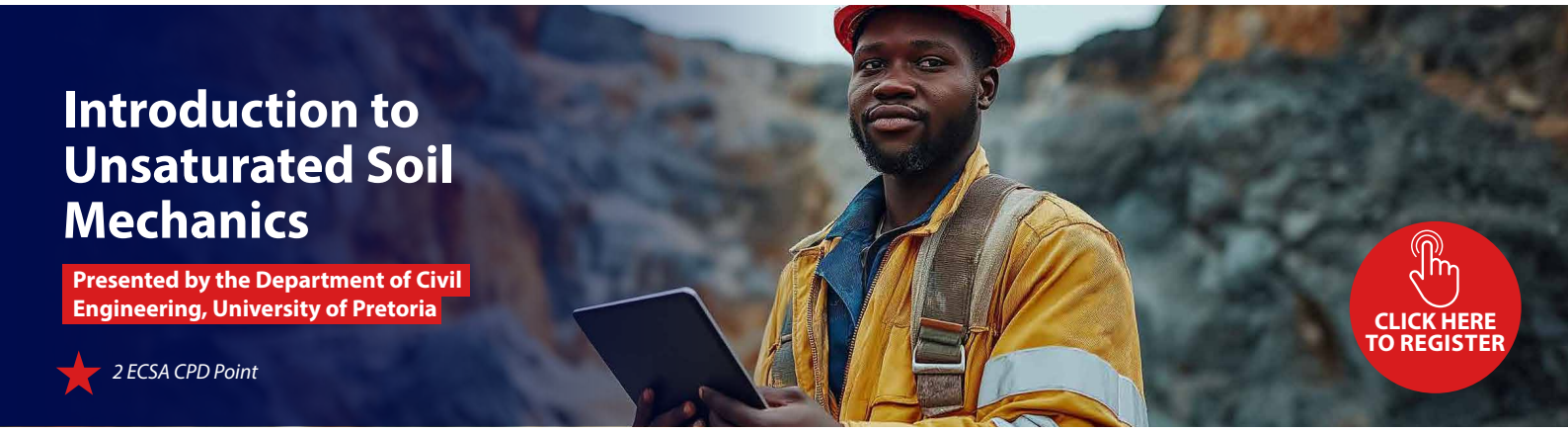
CLICK HERE TO REGISTER

The aim of the Theoretical Soil Mechanics short course is to provide practicing engineers with a sound understanding of critical state soil mechanics. The theory of consolidation and shear behaviour of soil can be unified within the framework of critical state soil mechanics. Important aspects such as stress invariants and stress paths will be revised before developing the concept of a state boundary surface and its application to describe the behaviour of normally and overconsolidated soil. Themes that will be covered include the critical state line, Roscoe surface, Hvorslev surface, drained and undrained planes and elastic walls. Concepts such as a yield surface, hardening law and flow rule will be introduced before presenting the Cam Clay and NorSand models. Postgraduates students registered for the Honours Degree in Geotechnical Engineering are required to attend the course and pass the examination for Theoretical Soil Mechanics SGS 788. There is no formal evaluation of other course attendees.

Learning outcomes

After successfully completing this course, you should:

- Have a thorough understanding of the critical state concept and its application in geotechnical engineering, including an understanding of:
- Stress invariants, stress paths and the state boundary surface plasticity theory and the Cam Clay and NorSand models,
- Be able to plot stress paths for drained and undrained loading of soil and calculate the deviatoric stress, mean effective stress, void ratio and pore pressure at failure
- Be able to use plasticity theory to calculate elastic and plastic strains of soil during shear.



Introduction to Unsaturated Soil Mechanics

Presented by the Department of Civil Engineering, University of Pretoria

2 ECSA CPD Point

CLICK HERE TO REGISTER

one-day course focusing on the theoretical framework and practical aspects of unsaturated soil mechanics in geotechnical engineering. The emphasis is on fundamental principles, stress state variables, steady-state and transient flows, soil-water characteristics, theory of shear strength and its measurement, soil stiffness, plastic and limit equilibrium analyses of earth pressures, slope stability and bearing capacity. Attention will be paid on how to extend classical saturated soil mechanics to encompass unsaturated soil behaviour. Engineering applications and the application of unsaturated soil mechanics in design are also discussed. The aim of this course is to enable students, researchers and engineers to understand the fundamental principles and advanced concepts of unsaturated soil mechanics and their applications to geotechnical and geo-environmental engineering problems such as landfill cover systems, concrete block retaining walls, embankment, etc.

Learning outcomes

After successfully completing this course, you should have a basic understanding of the fundamental principles of unsaturated soil mechanics and its application in geotechnical engineering, including an understanding of:

- Definition of unsaturated soils, and identification of scenarios where unsaturated soil mechanics are likely to influence the geotechnical behaviour
- Phases in unsaturated soils, stress state variables, capillarity, surface tension and soil water retention curve
- Measurement of soil suction in the field and laboratory, measurement and fitting of soil water retention and shrinkage curves
- Seepage in unsaturated soils and unsaturated permeability
- The role of soil suction on shear strength the measurement of unsaturated shear strength
- Plastic and limit equilibrium analyses with a focus on earth pressures, bearing capacity and slope stability the role of soil suction on shear stiffness and unsaturated shear stiffness measurement
- The application unsaturated soil mechanics on geotechnical and geo-environmental engineering problems, such as slope stability, temporary trench excavations, and landfill cover systems including capillary barriers.

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Modelling and Simulation of Wastewater Treatment Processes

Presented by the Department of Chemical Engineering, University of Pretoria

5 ECSA CPD Points and 5 SACNASP CPD Points

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The short course in Modelling and Simulation of Wastewater Treatment Processes provides you with a framework for demonstrating and fine-tuning the processes that are commonly used in wastewater treatment plants. During the course, basic kinetic concepts for the removal of water pollutants will be presented together with the application of kinetic principles in several reactor designs. You will not only be provided with a comprehensive overview of important biochemical kinetic reactions, but you will also be able to apply practical skills and expand your knowledge in the design and operation of real systems through specialised software that simulates these processes.

Learning outcomes

By the end of this course, participants will be able to:

- Explain key biochemical kinetic reactions relevant to environmental and reactor systems.
- Differentiate between unit operations and unit processes, and evaluate their applications in practice.
- Analyse and simulate batch processes for treatment system design and optimisation.
- Assess hydraulic retention time (HRT) and residence time distribution (RTD) in reactor performance.
- Evaluate the effects of dispersion and mass transfer in reactor systems.
- Model and simulate Continuous Stirred Tank Reactors (CSTR) and continuous flow processes.
- Perform transient simulations of reactors in series, incorporating pollutant removal kinetics.
- Analyse and simulate the operation of packed-bed fixed-film (biofilter) reactor systems.

Advanced Modelling and Simulation of Aquatic Systems – Case Studies

Presented by the Department of Chemical Engineering, University of Pretoria

4 ECSA CPD Points and 4 SACNASP CPD Points

CLICK HERE TO REGISTER

This course provides detailed design and operation information and demonstrates how simulations are utilised in real-time operation of plants. Additionally, the course provides practical examples of evaluation of dynamics in natural ecosystems using computational modelling tools. A quick review of basic and advanced kinetic concepts for removal of pollutants in water will be presented. The class exercises will focus on the simulation of real-life ecosystems such as lakes, rivers and groundwater; continuous flow processes; packed-bed and plug-flow reactor systems; and mass transport linked systems such as membrane reactor compartments. The software to be used in the simulation processes will be provided without an additional cost. Exercises to help entrench the knowledge will be provided to be used as examples for the design and operation of real systems.

Learning outcomes

Upon successful completion of the course, the student/delegate will be able to:

- Set up and run simulations for pollutant response in natural aquatic systems (rivers, lakes).
- Set up and run simulations for pollutant removal in reactors and activated sludge systems.
- Advise on the best choice of treatment process given particular loading conditions.
- Design and evaluate the operation of complex reactor systems (biofilms, membranes, catalytic packed-bed, etc.).

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Operation of Water and Wastewater Treatment Plants

Presented by the Department of Chemical Engineering, University of Pretoria

4 ECSA CPD Points | 4 SACNASP CPD Points

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The Operation of Water and Wastewater Treatment Plants short course provides you with a theoretical and practical knowledge base on water and wastewater treatment, as well as the operation of water treatment plants. During the course, you will be empowered to make informed decisions about drinking water treatment processes and the quality of drinking water. The course also covers topics of basic water chemistry, drinking water quality requirements, wastewater treatment, effluent quality and the proper disposal of effluents. You will be able to apply your acquired skills to better evaluate the operation and control of water and wastewater treatment plants.

Learning outcomes

By the end of this course, participants will be able to:

- Explain fundamental principles of water chemistry and microbiology as they apply to water and wastewater treatment.
- Evaluate drinking water quality requirements and applicable standards.
- Describe the processes and functioning of drinking water treatment systems.
- Assess the operation, optimisation, and troubleshooting of drinking water treatment plants.
- Analyse residue treatment and disposal practices in water treatment systems.
- Interpret wastewater quality parameters and applicable discharge regulations.
- Describe key wastewater treatment processes and their applications.
- Evaluate the operation and performance of activated sludge processes.
- Assess process efficiency and implement optimisation and troubleshooting strategies in wastewater treatment plants.
- Analyse sludge treatment and disposal methods within wastewater management systems.

Advanced Course in Water Treatment Processes

Presented by the Department of Chemical Engineering, University of Pretoria

5 ECSA CPD Points and 5 SACNASP CPD Points

CLICK HERE TO REGISTER

The Advanced Course in Water Treatment Processes provides you with an overview of both the theoretical and practical aspects of industrially relevant advanced water treatment processes. Topics include chemical water treatment, advanced oxidation processes, calculating the required chemical doses required for various chemical water treatment processes, desalination and membrane technology. The course als Modelling and Simulation of Wastewater Treatment Processeso includes a review of the current South African water crisis and the need for alternative water resources, development of new treatment processes, energy considerations, basic water chemistry, examples of advanced water treatment technologies, the scientific basis and limitations, operational considerations, case studies and advances in membrane technologies.

Learning outcomes

By the end of this course, participants will be able to:

- Analyse the South African water crisis and evaluate the need for alternative water resources.
- Assess the requirements for advanced water treatment processes in addressing modern water challenges.
- Evaluate energy considerations in water treatment and their impact on sustainability.
- Apply fundamental principles of water chemistry to water treatment processes.
- Identify and compare advanced water treatment technologies and their applications.
- Explain the scientific basis, capabilities, and limitations of selected treatment technologies.
- Assess key operational considerations for implementing and managing advanced treatment systems.
- Demonstrate an understanding of the operation of electrodialysis and ion-exchange processes.
- Analyse real-world case studies to inform practical decision-making.
- Evaluate large-scale water treatment operations through exposure to the Emalahleni Acid Water Desalination Plant.
- Explore emerging trends and advances in membrane technologies for water treatment.

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Risk and Reliability Analysis in Geotechnical Engineering

Presented by the Department of Civil Engineering, University of Pretoria

1 ECSA CPD Point

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The Reliability Methods in Geotechnical Engineering course comprises part of the taught component of a postgraduate subject, Analytical Soil Mechanics SGS 787, taught as part of the Honours Degree in Geotechnical Engineering at the University of Pretoria. Analysis techniques used in geotechnical engineering typically estimate the collapse load or the factor of safety applicable to a boundary value problem. However, the magnitude of the collapse load or the factor of safety does not provide information on the probability of failure. It is often the probability of failure, more so than the actual factor of safety, that is important for engineers and their clients. In this course a number of techniques are introduced for the calculation of the probability of failure. A working knowledge of basic statistical principles is assumed, but important concepts will be briefly reviewed. Postgraduates students registered for the Honours Degree in Geotechnical Engineering are required to attend the course and pass the examination for Analytical Soil Mechanics SGS 787. There is no formal evaluation of other course attendees.

Learning outcomes

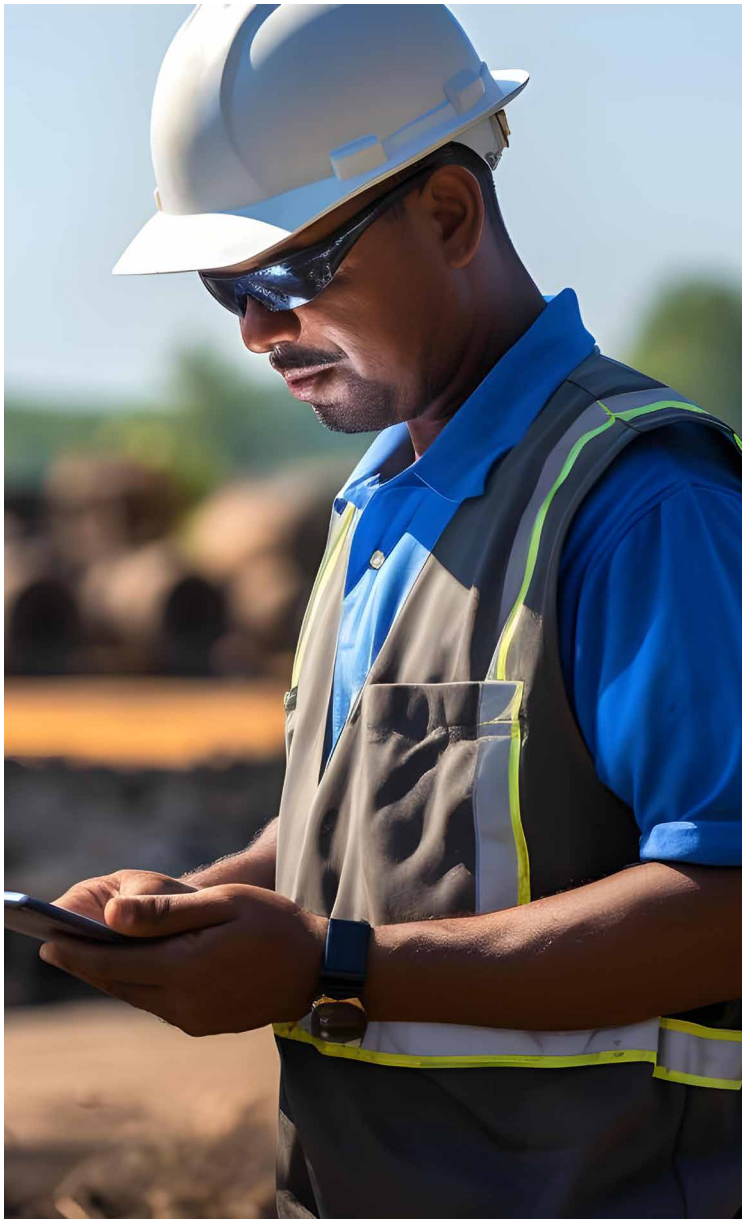
After successfully completing this course, you should:

Have a basic understanding of the statistical principles of reliability including
- An ability to plot probability density functions from data
- Knowledge and understanding of the normal, log-normal, uniform and exponential distributions
- An ability to determine probabilities from above mentioned distributions
- Understanding of the importance of correlation
- Understanding of the principle behind a performance function
- Ability to determine probabilities of failure from normally distributed capacity and demand functions
- Understanding of the concept of a reliability index and how it relates to the probability of failure

Have an understanding and be able to apply the Monte Carlo Analysis Method, including
- Generation of sets of random numbers with specified statistical distributions and correlations
- Implementation of the technique in a spreadsheet or computer program
- Determination of the required number of analysis steps to obtain a convergent solution

Have a basic understanding and be able to apply the FORM optimisation technique for the determination of reliability, including
- Understanding how the probability density of a performance function can be represented in multi-variate space
- Expression of the reliability index for multi-variate problems using the Hasofer-Lind method
- Implementation of the FORM technique in a spreadsheet and applying the solver function to solve practical multivariate reliability problems

Have an understanding and be able to apply the Point Estimate Method, including
- Understanding how moments represent the properties of a statistical distribution
- Understanding how a probability distribution can be represented by a system of point estimates
- Determination of moments (and hence expected values, variances and probabilities) from point estimates
- Application of the PEM to problems of one, two and three and multiple random variables



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River Modelling using HEC-RAS

Presented by the Department of Civil Engineering, University of Pretoria

4 ECSA and 4 SACNASP CPD points

CLICK HERE TO REGISTER

on the theory and analyses of practical river modelling problems using HEC - RAS. The basic theory of free surface flow, mass, energy and momentum conservation will be reviewed. The application to determine flood lines, culvert sizing, bridge flow hydraulics and dam break analysis will be covered. The widely used HEC-RAS software package will be reviewed and demonstrated by performing onedimensional (1D) and two-dimensional (2D) hydraulic calculations for steady and unsteady flow conditions. Delegates will learn how to approach and construct a numerical (1D and 2D) model for various flow conditions, and to effectively view and analyse results. A number of practical problems will be discussed and solved by delegates using HEC-RAS . This will acquaint you with background and confidence to conduct various flow simulations.

Learning outcomes

By the end of this course, participants will be able to:

- Basic hydraulics (flow regimes, controls and losses)
- Surface drainage (backwater calculations, flood lines)
- Gain hands-on HEC-RAS experience by participating in practical computer workshops
- Overview of two-dimensional flow theory and the differences between one-dimensional modelling
- Obtain valuable insights in methods for minimising computation errors and instabilities for two-dimensional unsteady hydraulic models
- Learn from "real world" projects and applications

Stormwater Management Fundamentals and Modelling

Presented by the Department of Chemical Engineering, University of Pretoria

CLICK HERE TO REGISTER

Urban flooding presents major challenges both in South Africa and internationally. In this practical course, we will discuss the fundamentals of stormwater management, with a focus on the urban environment, but with hands-on tutorials applicable to most small catchments in South Africa. Stormwater management planning, deterministic flood estimation methods, design storms and infiltration parameters will be discussed. The hydraulics of urban runoff will be described. The popular freeware software programme, EPA Storm Water Management Model (EPASWMM) will be demonstrated and used in the modelling of urban drainage systems.

Learning outcomes

By the end of this course, participants will be able to:

- Explain the fundamental principles of stormwater management and their role in urban water systems.
- Evaluate stormwater master planning approaches for effective catchment management.
- Apply design flood estimation methods used in South Africa for small catchments.
- Utilise design rainfall data and software tools to support stormwater planning and design.
- Generate and analyse design storms for stormwater management applications.
- Assess the role of infiltration in sustainable stormwater management.
- Explain flood routing principles and evaluate the effects of attenuation on storm runoff.
- Analyse the hydraulics of stormwater systems, including runoff from roadways, kerb and grid inlets, and flow in channels and pipes.
- Apply the Rational Method for design flood estimation in small areas.
- Use relevant computer applications and data sources for stormwater modelling and analysis.
- Demonstrate an understanding of EPASWMM for stormwater system modelling.
- Analyse pre- and post-development runoff scenarios and their impacts.
- Design and evaluate detention ponds for stormwater management.

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Waste Minimisation and Remediation

Presented by the Department of Chemical Engineering, University of Pretoria

4 ECSA and 4 SACNASP CPD points

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This short course explores the paradigm shift introduced by the National Waste Management Strategy (2010) and NEMWA (2008), which promotes viewing solid and hazardous waste as a valuable resource rather than a liability. The course covers environmental regulations related to waste collection and disposal, with a strong focus on recovery, reuse, and energy generation. Participants gain practical insight into Life Cycle Assessment (LCA), the Cradle to Grave approach, and waste valorisation technologies such as pyrolysis and carbonisation using refuse and biomass feedstocks. Case examples include common waste streams (paper, plastics, textiles, tyres) and alternative biomass sources (marula, coconut, peanut, moringa, and wood residues) for applications in water treatment and renewable energy systems.

Learning outcomes

By the end of this course, participants will be able to:

- Apply life cycle assessment (LCA) principles to evaluate the environmental impact of products and waste systems.
- Analyse environmental economics concepts to support sustainable decision-making.
- Assess risks associated with exposure to hazardous compounds and apply appropriate risk management strategies.
- Evaluate processes for the valorisation of waste biomass (e.g. timber, pulp, molasses) into useful products or energy.
- Design and optimise waste collection systems, incorporating planning and automation principles.
- Analyse and improve automated waste treatment and destruction processes for efficiency and sustainability.
- Evaluate the role and impact of paper, plastics, and the green hydrogen economy in sustainable development.
- Assess the potential of biomass energy sources as reliable baseload energy solutions, particularly within the South African context.

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Water Analysis, Monitoring and Plant Operation

Presented by the Department of Chemical Engineering, University of Pretoria

5 ECSA CPD Points and 5 SACNASP CPD Points

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The Water Analysis, Monitoring and Plant Operation short course equips delegates with up to date methods for water sampling, analysis, and data management to support informed decision making in water resources management and effluent treatment. The course responds to the declining quality of water resources due to agricultural and industrial pressures. Participants are introduced to modern analytical and field monitoring tools, including telemetry, remote sensors, GIS, and electronic data systems. The course also covers plant monitoring and optimisation, focusing on real time monitoring, compliance with effluent discharge standards, and troubleshooting for optimal plant operation.

Learning outcomes

By the end of this course, participants will be able to:

- Interpret and apply key regulatory frameworks, including the National Water Act and related compliance requirements.
- Analyse physical, chemical, and biological water quality parameters and their relevance in water resource management.
- Apply statistical principles and methods for water quality data analysis, including sampling and laboratory procedures.
- Evaluate water use patterns and challenges in crisis contexts, such as pandemics.
- Assess end-of-pipe and in-stream water quality standards and their implications for environmental compliance.
- Demonstrate practical knowledge of laboratory techniques and advanced analytical instruments used in water quality monitoring.
- Evaluate the use of remote monitoring, telemetry, and digital systems in Integrated Water Resources Management (IWRM).
- Apply field-based water monitoring protocols in real-world environments.
- Describe and evaluate conventional and advanced water and wastewater treatment processes, including membrane systems and ion exchange.
- Assess monitoring protocols for large-scale water and wastewater treatment works.
- Evaluate the environmental impacts of effluent discharge on aquatic systems and solids disposal on groundwater systems.
- Analyse opportunities for energy and resource recovery within wastewater treatment processes.
- Explain principles of water reclamation and reuse, including emerging contaminants (EPs and EDCs) and the three-barrier approach.
- Assess the role of stormwater recharge in water resource sustainability and identify key water quality challenges.
- Analyse the hydraulics of stormwater systems, including flow in channels and pipes.
- Apply design flood estimation methods, including the Rational Method, for small catchments.
- Utilise modelling tools and data sources for stormwater analysis and design.
- Demonstrate an understanding of EPASWMM for stormwater modelling.
- Evaluate pre- and post-development runoff scenarios and design appropriate stormwater control measures such as detention ponds.

Water Series Programme: Advances in Disinfection Technologies

Presented by the Department of Chemical Engineering, University of Pretoria

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A short, high-impact training programme designed for the South African and Southern African water sector, focusing on critical water security challenges. This intensive module equips professionals with practical, in-demand skills in drinking water disinfection and treatment. Module 1 covers essential topics including disinfection chemistry, chlorine demand testing, optimal dosing, distribution system management, monitoring strategies, and disinfection by-products (DBPs). Participants also explore alternative, non-chlorine disinfection technologies aligned with global standards set by WHO, IWA, and AWWA. Ideal for water engineers, scientists, and health professionals, this course strengthens capacity to deliver safe, compliant drinking water and protect public health.

Learning outcomes

By the end of this course, delegates will be able to:

- Make informed, critical life-or-death decisions regarding the safety of supplied communities
- Apply sound judgement on the use and future of energy-intensive disinfection processes
- Demonstrate a strong understanding of drinking water disinfection principles and practices
- Critically engage with emerging challenges in water safety and security
- Develop the ability to design innovative and sustainable solutions for drinking water disinfection
- Contribute to building a new generation of forward-thinking professionals in the water sector

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Water Series Programme: Nature-Based Advanced Water Treatment Processes

Presented by the Department of Chemical Engineering, University of Pretoria

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The Water Series Programme develops short, intensive modules directly relevant to the South African and broader Southern African water sector, with emphasis on emerging themes critical to long-term water security. The short-duration, high impact format enables focused, in-depth knowledge without diversion into broader topics. Module 2 provides detailed insight into current and future passive water treatment and resource recovery systems inspired by natural processes. Key focus areas include geothermal-powered treatment, pyrolysed adsorbents, microbial and hydrogen fuel cells, wetland reticulation systems, greywater utilisation, floating islands for reservoir restoration, and forward osmosis technologies. The module also explores advanced concepts such as photocatalysis and biological analogues inspired by photosynthesis. Addressing global concerns around emerging pollutants and endocrine-disrupting chemicals (EDCs), this course emphasises innovative, sustainable solutions. It equips delegates with the understanding that where conventional systems are inadequate, nature-inspired engineering approaches can be adapted to support sustainable water management.

Learning outcomes

By the end of this course, delegates will be able to:

- ✔ Integrate nature-based, passive water treatment systems with a low to zero carbon footprint
- ✔ Apply principles of resource recovery and sustainable water management
- ✔ Critically observe and interpret natural processes for engineering applications
- ✔ Design innovative water treatment solutions inspired by nature
- ✔ Evaluate the role of nature-inspired systems in addressing emerging water challenges
- ✔ Contribute to sustainable, future-focused water treatment practices in the sector

Water Series Programme: Water Losses & Non-Revenue Water Elimination

Presented by the Department of Chemical Engineering, University of Pretoria

CLICK HERE TO REGISTER

The Water Series Programme develops short, intensive modules directly relevant to the South African and broader Southern African water sector, with emphasis on emerging themes critical to long-term water security. The short-duration, high-impact format enables participants to gain focused, in-depth knowledge without diversion into broader topics. Module 3 addresses water losses (Non-Revenue Water – NRW) in distribution systems, including physical losses (leaks and pipe bursts) and commercial losses (theft, metering inaccuracies, and billing errors). These losses represent significant wasted resources, impacting utility efficiency, finances, and water quality. The course explores the economic and political implications of NRW, its impact on society, and the systemic challenges that contribute to underinvestment in maintenance. It also covers current advances in distribution system monitoring, leak detection technologies, and early action planning, equipping professionals with practical strategies to reduce losses and improve system performance.

Learning outcomes

By the end of this course, participants will be able to:

- ✔ Apply updated knowledge on the status of water supply networks in South Africa
- ✔ Understand key policy, governance, and regulatory frameworks affecting NRW
- ✔ Identify causes of water losses, including physical and commercial losses
- ✔ Implement technical strategies to minimise leaks and improve distribution efficiency
- ✔ Apply monitoring and leak detection technologies to reduce Non-Revenue Water
- ✔ Support improved water management, financial sustainability, and service delivery

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Water Quality Management and Effluent Treatment

Presented by the Department of Chemical Engineering, University of Pretoria

5 ECSA CPD Points and 5 SACNASP CPD Points

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The Water Quality Management and Effluent Treatment short course provides a practical overview of water management, pollution control legislation, and modern water quality monitoring and analysis methods. It covers fundamental water quality assessment, suitability of use, and pollutant mitigation, with a strong focus on the shift toward wastewater treatment, resource recovery, and ecological integration. The course includes hands on laboratory sessions and a field visit, exposing participants to current analytical techniques and electronic catchment management tools. It equips water sector professionals with practical knowledge to support effective management, operational, and technological decision making in safeguarding Southern Africa's water resources.

Learning outcomes

By the end of this course, participants will be able to:

- Analyse global and regional water resources, including hydrology and geohydrology, and evaluate water allocation and use.
- Interpret historical and contemporary water governance frameworks, including Roman Water Law principles and the National Water Act.
- Assess water use patterns and challenges in special contexts, such as pandemics.
- Evaluate end-of-pipe and in-stream water quality standards for regulatory compliance.
- Analyse physical, chemical, and biological water quality parameters and their impact on water systems.
- Apply standard and advanced laboratory methods for water quality analysis, including modern analytical instrumentation.
- Evaluate the role of remote monitoring and telemetry in Integrated Water Resources Management (IWRM).
- Apply field-based water monitoring protocols in real-world environments.
- Describe and evaluate conventional and advanced water and wastewater treatment processes, including membrane systems and ion exchange.
- Assess monitoring protocols for large-scale water treatment works.
- Evaluate the environmental impact of effluent discharge and solids disposal on aquatic and groundwater systems.
- Analyse opportunities for energy and resource recovery in wastewater treatment processes.
- Explain water reclamation and reuse principles, including emerging pollutants (EPs and EDCs) and the three-barrier approach.
- Assess stormwater recharge and its role in sustainable water resource management, including key water quality considerations.
- Analyse the hydraulics of stormwater systems, including flow in channels and pipes.
- Apply design flood estimation methods, including the Rational Method, for small catchments.
- Utilise modelling tools, data sources, and EPASWMM for stormwater analysis and simulation.
- Evaluate pre- and post-development runoff scenarios and design appropriate stormwater control measures, including detention ponds.

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Additional Programmes

- Advanced HEC-RAS
- Computational Fluid Dynamics (CFD) modelling of Wernhill stormwater canal and culvert system
- Flood Hydrology and Stormwater Modelling
- Flood Hydrology and Urban Stormwater Modelling
- GIS Applications for Water Engineers
- GIS Applications for Water Practitioners
- Leadership for Technical Women
- Occupational Hygiene Risk Assessment Measuring Techniques and Water Sampling-Pet
- Measurement and Mitigation of dust in opencast mining
- Membrane Processes
- Mine Dewatering Design and Implementation
- Spreadsheets as an Engineering Tool
- Programme in Energy Efficiency for buildings and Wastewater Treatment Plants
- Water Resources Planning

Research and Consulting Solutions

- Assessment of soda ash product requirements for specialized applications
- Computational Fluid Dynamics (CFD) modelling of Wernhill stormwater canal & culvert system
- Embedding Sustainability at Sibanye-Stillwater Southern Africa
- Environmental Water Requirements (EWR) for rivers downstream of each of the 3 Lufubu hydropower cascade dams
- Evaluation of crack on water jacket of spinner motor_CWE
- Evaluation of Failed Water Pipes
- Evaluation of Municipal wastewater treatment for reuse
- Examine by stereo-macrography the fracture in the Aluminium blade of a water cooling fan of a Hitachi heavy duty mining truck
- Expert Chemical Engineering Consultancy Services
- G-841 Investigation into contaminated fuel
- Glencore Waterval East TMM collision avoidance system
- Goodey's Guesthouse Water and Energy Efficiency Assessments
- GTIP Energy and Water Efficiency Assessment
- Literature review into water consumption and stormwater runoff from warehouses
- Measurement of soil water retention curves
- Measurement of Soil Water Retention Curves (Quantity of 1)
- Measurement of Soil Water Retention Curves and Foundation Indicators
- Metallurgical investigation into the failure of sections from three four-cylinder crankshafts A, B and C, used by Sibanye-Stillwater
- Migration of radon and other radionuclides in groundwater systems
- Modelling of critical equipment on the Plasma Gasification system_ AC-PGR-RFQ-180
- Participation in the Sibanye Stillwater investigation into mining induced seismicity
- Pyrophyllite consulting services
- Rand Water Chair: Water Utilization
- Scientific Advisory Services Around Innovative Green Tech Waste Management and Cleaning
- Soil Water Retention Curves (SWRC)
- Solar water heaters comparison study
- Techno-economic evaluation of the extraction of lithium
- Testing of Rockdrill samples_G-737
- The determination and quantification of Environmental Water Requirements (EWR) for the Fish River below the Neckartal Dam sub-consultancy
- To Conduct a Cost-Comparative Analysis of Two Approaches (Internal Provision of Rudimentary Water Services Versus Provision Through External Service Providers) to Informal Settlements
- To provide M&V services for the Driefontein 5# - Service Water Optimisation Project
- Use Waste Hierarchy and Circular Economy Principles to Develop an Incentive Model that Will Determine an Economically Sound Processing Fee
- Vibration Impact Assessment for the uMkomazi Water Project
- Water CGE Simulation
- Water Governance & Institutional

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