



## The Vadose Zone: Variable Saturation in Engineering Geology and Hydrogeology

Presented by the Department of Geology, University of Pretoria

1 SACNASP CPD Point | CPD Reg No: 2018-0115-000439

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Variably saturated flow conditions are increasingly relevant to geotechnical and hydrogeological assessments. This is most evident in the so-called vadose zone that extends from land surface to the phreatic surface, and which is characterised by variably saturated hydrological systems mostly at negative pore water pressures. **The Vadose Zone: Variable Saturation in Engineering Geology and Hydrogeology** short course explores this zone which is fundamental in understanding the subsurface component of the hydrological cycle, emphasising processes such as evapotranspiration, interflow, and groundwater recharge. Variable saturation provides special conditions whereby water not necessarily gravitates, and where aerobic or oxidising conditions can exist. This has important implications on groundwater recharge, vulnerability and susceptibility to contamination, as well as on the integrity of infrastructure and water management in the built environment.

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## Course content

### Session 1

- Earth materials, their distribution, materials and mass properties, and weathering of rock
- Mechanics of soil, rock, discontinuities and fluids, and emphasising phase relationships, quantification, variably saturated flow mechanisms and regimes
- Hydraulics: the hydrological cycle, parameters and quantification, and hydrostratigraphy

### Session 2

- Variably saturated flow through improvement of conceptual models at different scales of assessment using physical models, laboratory experiments, field validation, and geochemical methods
- Intergranular, fractured, and karstic systems at partial saturation, including interfaces, networks, discreet and bulk systems, and anthropogenic influences

## Learning outcomes

After successfully completing this course, you will

- have advanced theoretical and practical knowledge pertaining to variably saturated flow from a geological and hydrogeological context
- have improved your understanding and application of subsurface flow processes and mechanisms, as well as how these can be quantified and mitigated, and
- know how to infer behaviour and project life implications based on improved conceptual models of variably saturated systems in soil, rock and karst.

## Who should enrol?

This course is suitable for earth, water and environmental scientists and engineers, working with cross-disciplinary data pertaining to the impacts of subsurface waters and seepage on water quality, the integrity of infrastructure, and the due diligence for environmental consequences of altering water budgets and flow paths.

## Course fees

### R3 000.00 per delegate (VAT incl.)

Course fees include all course notes, text books and refreshments during contact days.

**Course fees must be paid in full 14 days prior to course start dates. Proof of payment can be submitted to [enrolments@enterprises.up.ac.za](mailto:enrolments@enterprises.up.ac.za).**

## Admission requirements

Prospective delegates should at least have a four-year qualification in natural science or engineering (BSc Hons, BTech, BEng), or equivalent.

## Accreditation and certification

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## Registration and enquiries

### Course coordinator

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### Course leader

Dr Matthys Dippenaar

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