

UDEC Training Course
Basic Concepts and Recommended Procedures for
Geotechnical Numerical Analysis

This course introduces users to the application of UDEC for geotechnical numerical analysis. The three-day course includes two days of software fundamentals with discussions on the theoretical background, basic concepts and modelling principles for geotechnical analysis, and a third day of practical applications. Topics include: model creation, application of boundary conditions, selection of appropriate constitutive (material) models for blocks and joints, solution of the static equilibrium state, simulation of the construction stages, installation of structural support, and inclusion of fluid flow in joints. Example applications of UDEC for analysis of practical geotechnical problems will be illustrated during the third day. The course also includes discussion on using the built-in programming language in UDEC (called FISH) to manipulate the UDEC model. This is "hands-on" training, and exercises with UDEC are provided throughout the course.

Day 1

- **Introduction to UDEC**
 - Overview of potential applications and capabilities in geo-engineering analysis and design
- **Introduction to the UDEC graphical interface**
 - Menu-driven versus command-driven operation
- **DEM Theoretical Background**
 - Discontinuum analysis
 - Distinct element method
 - Explicit finite-difference solution scheme
- **UDEC Operation**
 - Recommended solution procedure
- **Model generation**
 - Fitting the UDEC model to a problem region
 - Joint generation
- **Basic material models**
 - Deformable versus rigid blocks
 - Deformable-block material models
 - Joint material models
- **Boundary conditions / Initial conditions**
 - Applying boundary conditions
 - Initialising variables
- **Solution**
 - Solving for force equilibrium
 - Cycling to monitor material failure

Day 2

- **Introduction to FISH in UDEC**
 - FISH variables, arithmetic, syntax and data types
 - Writing FISH functions
- **Fluid flow in joints**
 - Joint fluid flow model
 - Modeling steady-state and transient fluid flow in joints
- **Factor of Safety Calculation**
 - Implementation of the strength reduction method in UDEC
- **Soil/Rock structure Interaction**
 - Local reinforcement elements
 - Cable elements
 - Beam elements
 - Support elements

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Day 3

- ***Practical Applications 1 - Tunnel Construction***
 - Tunnel support loading
 - Shotcrete and cable support of a circular tunnel
- ***Practical Applications 2 - Rock Slope Stability***
 - Rockslide run-out prediction,
 - Fluid flow through a jointed rock slope
 - Step-path failure of a rock slope