

# 3DEC Training Course

## Basic Concepts and Recommended Procedures for Geotechnical Numerical Analysis

This course introduces users to the application of 3DEC for geotechnical numerical analysis. The three-day course provides an overview of the capabilities and features of 3DEC and covers software fundamentals with discussions on the theoretical background, basic concepts and modelling principles for geotechnical analysis. 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 and installation of structural support. The course includes discussion on using the built-in programming language in 3DEC (called FISH) to manipulate the 3DEC model. This is "hands-on" training, and exercises with 3DEC are provided throughout the course.

### Day 1

- ***Introduction to 3DEC***
  - Overview of potential applications and capabilities in geo-engineering analysis and design
  - New features in 3DEC
  
- ***Introduction to the 3DEC graphical interface***
  - Menu-driven versus command-driven operation
  
- ***DEM Theoretical Background***
  - Discontinuum analysis
  - Distinct element method
  - Explicit finite-difference solution scheme
  
- ***3DEC Operation***
  - Recommended solution procedure
  -
  
- ***Model generation***
  - Fitting the 3DEC model to a problem region
  - Joint generation

### Day 2

- ***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
  
- ***Introduction to FISH in 3DEC***
  - FISH variables, arithmetic, syntax and data types
  - Writing FISH functions

**3DEC Training Course**  
**Basic Concepts and Recommended Procedures for**  
**Geotechnical Numerical Analysis**

Day 3

- ***Factor of Safety Calculation***
  - Implementation of the strength reduction method in 3DEC
  
- ***Soil/Rock structure Interaction***
  - Local reinforcement elements
  - Cable elements
  - Beam elements
  - Support elements
  
- ***Use of third-party model generators (Rhino + Kubrix)***
  
- **User questions and general modelling advice**