



# *FLAC<sup>3D</sup>*™ VERSION 4.0 TRAINING COURSE

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This course provides an introduction to FLAC3D for application to geotechnical analysis. The three-day course provides an overview of the capabilities and features in FLAC3D and covers software fundamentals with discussions on the theoretical background, basic concepts and modeling principles for 3D geotechnical analysis. Topics include: grid generation, application of boundary conditions, constitutive (material) models, solution of the static equilibrium state, installation of structural support, and inclusion of either transient or steady groundwater flow states. The course includes discussion on using the built-in programming language in FLAC3D (called FISH) to manipulate the FLAC3D model. This is “hands-on” training, and exercises with FLAC3D are provided throughout the course.

## Day 1

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- **Introduction to FLAC3D**
  - Overview of potential applications and capabilities in geo-engineering analysis and design
  
- **FLAC3D Operation**
  - Installation and operation procedures
  - Manual, examples and general assistance
  - File management
  - Sign convention and System of units
  - FLAC3D nomenclature
  - Solution procedure
  
- **FLAC3D Theoretical Background**
  - Explicit Finite-Difference solution
  
- **The FLAC3D User Interface**
  - Projects
  - Plotting
  
- **Grid Generation**
  - Primitive shapes
  - Grid altering
  - impgrid/expgrid
  - flacextrude

## Day 2

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- **Basic Material Models**
  - Assigning models and properties
  - Boundary Conditions / Initial Conditions
  - Solving for force equilibrium
  - Interfaces
  
- **Introduction to FISH**
  - *FISH* variables, arithmetic, syntax and data types
  - Writing *FISH* functions
  - Simple exercises
  - Advanced topics
    - boundary conditions on complicated grids
    - gradual excavations
  
- **Advanced material models**
  - Characteristics of soil and rock
  - Constitutive models in FLAC3D to represent continuum and discontinuum behaviour
  - Selecting appropriate material models and properties
  - CPP UDMs (User Defined Models)
  - changing material properties during cycling
  
- **Factor of Safety Calculation**
  - Implementation of the strength reduction method in FLAC3D
  - slope stability analysis exercise
  
- **Introduction to Effective Stress and Groundwater Analysis**
  - Effective stress analysis
  - Governing equations for transient fluid flow and coupled analysis
  - Recommended approaches for fluid flow – mechanical calculations

## Day 3

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- ***Effective Stress and Groundwater Analysis Continued ...***
  
- ***Soil/Rock Structure Interaction***
  - Types of structural elements in FLAC3D:
  - beams, cables, piles
  - shells, geogrids, liners
  - Structural element connections to the main grid (links and attach conditions)
  - Stresses in shells (stress recovery procedure)
  
- ***Use of third-party grid generators (Rhino-KUBRIX)***
  
- ***User questions***