



Fundamentals of Rock Slope Stability Analysis using Numerical Methods

25 March 2022

Course Description

Rock mechanics deals with the behaviour of rocks under the influence of loading or unloading. The engineering principles are applied to the design of rock structures, such as tunnels, underground caverns and rock slopes.

Topics to be covered

Part 1:

After introducing the engineering properties of rock, the initial part of the course will concentrate on describing rock mass properties and stress-strain behaviour. Participants will learn about intact rock, discontinuities and rock masses, rock strength testing, rock mass classification and principles of rock engineering designs. Topics to be covered during part 1 are:

- Overview of rock engineering problems
- Introduction to rock mechanics: intact rock, discontinuities and unique behaviours of rock masses
- Stresses
 - 2D and 3D stress components, principal stresses, and pore pressures
 - Nature and origin of in-situ stresses
- Basic mechanics
 - Relationships between stress and strain, elasticity (linear and non-linear effects, brittle and ductile rock behaviour), consolidation and creep, normal and shear forces, stresses around excavations (example of the Kirsch solution)
 - Overview of standard rock mechanics lab tests – laboratory testing of strength and deformation behaviour of intact rocks and their interpretation to determine the strength and deformation parameters under uniaxial compression, triaxial compression and uniaxial tension
 - Fundamental theories on rock strength (Mohr-Coulomb and Hoek-Brown strength)
- Properties of intact rock: uniaxial compressive strength, tensile strength, triaxial strength, deformation response to stresses, elastic/Young's modulus, Poisson's ratio
- Geomechanics and structural geology
 - Influence of faults, shear zones, bedding planes, joints and other discontinuities on rock mass response to stress and excavation
 - Characterization of rock discontinuities and their fundamental properties
- Analysis of discontinuity orientations using hemispherical projection

Part 2



The second part of the course will examine the behaviour and analysis of slopes in blocky rock masses. This component aims to help participant fuse their knowledge of rock mechanics fundamentals with the design of slopes in rock. It will cover failure mechanisms of surface excavations in rock, techniques and tools for analyzing slope rock of failure mechanisms, and methods for analyzing the stability of rock slopes. Topics to be covered in part 2 are:

- Rock slope failure mechanisms
- Application of failure criteria to the strength of intact rock, discontinuities and rock masses
- Analysis of slope failure mechanisms using kinematics (application of DIPS)
- Analysis of slope stability using numerical methods (application of RS2)

Softwares

The course will rely on software tools developed by Rocscience (Dips and RS2) for the analysis. It is expected that participants will learn to undertake simple rock mechanics and rock engineering analysis with the help of the software tools.

The course is planned for one whole day comprising eight hours. Rocscience will provide participants with 30-day trial licenses of the entire Rocscience software suite.

Speaker and Company profile

Reginald Hammah, Ph.D., MGHIE
 Director, Rocscience Africa
 Cell: +233-54-144-3134 Tel.: +233-24-243-9716 | rocscience.com
 9 Watsons Avenue, Mayfair Gardens, East Airport, Accra, Ghana
 Postal Address: DTD5363
 Digital Address: GA-276-8888



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