



Rock Mechanics and Mining Geotechnical Engineering Course: Pit Slope Design and Ground Control



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Introduction:

Rock mechanics and mining geotechnical engineering training on pit slope design and ground control is a 5-day course for geotechnical, mining engineering, engineering geology and ground control staff, ending with a Geotechnical Ground Control Management Plan for a case mine. Mines lose ore, equipment and production days when wall angles rest on thin structural data, monitoring alarms lack agreed responses and reinforcement in drives is chosen without checking capacity against demand. Nominees already log core, map faces or review stability analyses, and they build each calculation through modelling build exercises. CoreConcept Training Center delivers this rock mechanics course.

Course Objectives:

- Derive intact rock and rock mass strength parameters from laboratory results, RMR, Q-system and GSI ratings using the Hoek-Brown criterion
- Process joint orientation and shear strength data into structural domains and run stereonet kinematic checks for planar, wedge and toppling release
- Calculate factor of safety and probability of failure for rock walls with Bishop, Spencer and Sarma limit equilibrium methods and judge when numerical models are needed
- Set bench face, berm, inter-ramp and overall wall angles against agreed acceptance criteria for each geotechnical sector
- Specify slope radar, survey prism and piezometer networks with alarm thresholds and trigger action response plans
- Size reinforcement for drives and crosscuts using ground reaction curves, wedge checks and support capacity against demand

Target Audience:

- Geotechnical engineering staff responsible for wall design, stability analyses and ground control standards
 - Mining engineering staff responsible for turning geotechnical sectors into mineable bench and ramp geometry
 - Engineering geology staff responsible for core logging, face mapping and structural models
 - Ground control supervisors responsible for reinforcement installation, inspection and quality testing
 - Slope monitoring staff responsible for radar, prism and piezometer data review and alarm response
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Course Outline:

Day 1: Rock Mass Behaviour, Geomechanical Data and Failure Mechanisms

- Intact Rock Strength From Uniaxial and Triaxial Laboratory Tests
- Discontinuity Orientation, Spacing and Persistence From Oriented Core
- Joint Roughness Coefficient, Infill and Shear Strength Inputs
- In Situ Stress Regime and Groundwater Effects on Rock
- Mine Wall Failure Case Histories and Root Cause Patterns

Day 2: Rock Mass Classification, Strength Criteria and Structural Domains

- RMR and Q-System Ratings Compared for Mine Domains
- GSI Chart Estimation From Blockiness and Surface Condition
- Hoek-Brown Criterion Parameters With Blast Disturbance Factor
- Equivalent Mohr-Coulomb Strength Fitting for Design Stress Range
- Structural Domain Definition From Stereonet Pole Clusters

Day 3: Kinematic Analysis, Limit Equilibrium and Slope Design Criteria

- Stereonet Kinematic Screening for Planar, Wedge and Toppling Release
- Bench Face Angle and Berm Width Reliability Assessment
- Bishop, Spencer and Sarma Limit Equilibrium Wall Checks
- Factor of Safety and Probability of Failure Acceptance Tables
- Inter-Ramp and Overall Wall Angle Selection by Sector

Day 4: Slope Monitoring, Numerical Models and Underground Reinforcement Design

- Slope Stability Radar and Survey Prism Network Layout
- Inverse Velocity Analysis for Failure Time Forecasting
- Trigger Action Response Plan Alarm Levels and Actions
- Finite Element and Discrete Element Model Applicability Checks
- Ground Reaction Curve and Reinforcement Capacity Against Demand

Day 5: Modelling Build of the Geotechnical Ground Control Management Plan

- Case Mine Data Pack Review and Domain Strength Table
 - Sector Wall Angle Recommendation From Analysis Results
 - Monitoring Network and Alarm Threshold Schedule for Case Pit
 - Wedge Check and Reinforcement Pattern for Case Decline
 - Geotechnical Ground Control Management Plan Completion and Review
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Skills You Will Gain:

- Geomechanical Data Interpretation
- Rock Mass Strength Estimation
- Structural Domain Modelling
- Kinematic Failure Screening
- Rock Slope Reliability Analysis
- Slope Displacement Monitoring
- Excavation Reinforcement Sizing
- Ground Hazard Response Planning

Why Attend This Course:

- Deliver a Geotechnical Ground Control Management Plan to the geotechnical manager and the mine technical services lead as the reference for wall angles, monitoring and reinforcement
- Decide whether a wall sector can be steepened, must be flattened or needs added monitoring before the next cutback is released
- Avoid wall collapses, buried equipment and fall-of-ground incidents caused by unchecked structure, silent alarms or undersized reinforcement
- Coach junior engineers and geologists using the strength tables, kinematic templates and capacity-demand sheets built during the course

Conclusion:

Back at work, the participant hands the Geotechnical Ground Control Management Plan to the geotechnical manager and the mine technical services lead. They use it to approve wall angles for each sector, set radar and prism alarm levels with the agreed responses, and specify reinforcement for new drives and crosscuts. After the first quarter of mining under the plan, the unit should compare measured wall displacement, bench condition, alarm events and ground falls with the design assumptions and revise the strength and structural inputs where they diverge.

Frequently Asked Questions FAQ:

What should participants know before the rock mechanics and mining geotechnical engineering course?

Participants should already log core, map rock faces or review stability results, and understand stress, strength and factor of safety. Bringing a structural dataset, wall design or reinforcement standard from their own operation helps them apply each modelling exercise.

How does the rock mechanics and mining geotechnical engineering course differ from a mine planning or soil investigation course?

This course designs rock walls, monitoring and reinforcement from geomechanical data. Mine planning courses optimise pit shells and schedules, and soil investigation courses cover boreholes, soil tests and earthworks rather than jointed rock behaviour.

Why does rock mechanics and mining geotechnical engineering use both kinematic and limit equilibrium analysis?

Kinematic analysis shows which blocks can move given joint orientation, while limit equilibrium measures whether they will move given strength and water pressure. Using both separates geometry-controlled bench failures from larger rock mass failures across a wall.

What does a participant take back from the rock mechanics and mining geotechnical engineering course?

Each participant takes back a Geotechnical Ground Control Management Plan for a case mine, with a domain strength table, sector wall angles, a monitoring alarm schedule and a reinforcement pattern, plus calculation templates adaptable to their own site.
