Rock Engineering Training Course

Professional Development Training Course Outline

Category	Construction Institute	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Rock Engineering is a critical discipline in mining, tunneling, underground construction, geotechnical engineering, infrastructure development, and energy projects, focusing on the analysis, design, and management of rock masses under complex geological conditions. Rock Engineering Training Course is designed to equip professionals with practical knowledge of rock mechanics, geological characterization, slope stability, underground excavation design, rock support systems, numerical modelling, and risk-based engineering solutions. The program integrates the latest industry practices, digital technologies, and international engineering standards to enhance decision-making in challenging rock environments.

The course provides a comprehensive understanding of rock mass behavior, excavation stability, ground control strategies, and sustainable engineering practices through real-world applications and case studies from mining operations, tunnels, dams, and major civil infrastructure projects. Participants will develop advanced capabilities in geotechnical risk assessment, failure prediction, underground safety management, and innovative rock engineering solutions to improve project performance, operational reliability, and environmental sustainability.

Programme Curriculum

Rock Engineering Training Course

Introduction

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Course Duration

5 days

Course Objectives

By completing this Rock Engineering Training Course, participants will be able to:

1. Understand advanced principles of rock mechanics and rock mass characterization.
2. Apply modern geotechnical investigation techniques for engineering projects.
3. Evaluate rock strength, deformation behavior, and failure mechanisms.
4. Perform slope stability analysis and underground excavation assessments.
5. Design effective rock reinforcement and ground support systems.
6. Apply classification systems including RMR, Q-System, and GSI methodologies.
7. Develop skills in geotechnical risk management and hazard mitigation.
8. Interpret geological data using advanced engineering approaches.
9. Utilize numerical modelling and simulation tools for rock engineering analysis.
10. Improve underground mine safety through proactive ground control strategies.
11. Implement sustainable and resilient rock engineering solutions.
12. Analyze real-world engineering challenges through industry case studies.
13. Apply global best practices for digital transformation in geotechnical engineering.

Target Audience

1. Mining Engineers and Mine Managers
2. Geotechnical Engineers
3. Rock Mechanics Specialists
4. Civil and Tunnel Engineers
5. Engineering Geologists
6. Underground Construction Professionals
7. Project Managers and Technical Consultants
8. Researchers, Academics, and Engineering Graduates

Course Modules

Module 1: Fundamentals of Rock Engineering and Rock Mechanics

- Principles of **rock mechanics and engineering geology**
- Rock properties including strength, elasticity, and permeability
- Geological structures and their influence on rock behavior
- Rock failure mechanisms and stress conditions
- Introduction to rock engineering design principles

- **Case Study:** Analysis of rock failure behavior in a deep underground mining operation and lessons learned from ground instability events.

Module 2: Geological Investigation and Rock Mass Characterization

- Geological mapping and site investigation techniques
- Rock core logging and laboratory testing methods
- Rock mass classification systems: **RMR, Q-System, and GSI**
- Structural geology and discontinuity analysis
- Digital geological data collection technologies
- **Case Study:** Rock mass classification application for a large-scale highway tunnel project.

Module 3: Rock Strength Testing and Mechanical Behavior Analysis

- Laboratory testing of intact rock properties
- Uniaxial and triaxial compression testing
- Shear strength evaluation of discontinuities
- Stress-strain behavior of rock materials
- Predicting rock deformation and failure
- **Case Study:** Evaluation of rock strength parameters for mine excavation stability improvement.

Module 4: Underground Excavation Design and Ground Control

- Underground excavation principles
- Stress redistribution around tunnels and mines
- Ground support design methodologies
- Rock bolts, anchors, shotcrete, and reinforcement systems
- Underground safety optimization
- **Case Study:** Implementation of advanced ground support systems in a deep underground mine.

Module 5: Slope Stability and Rock Slope Engineering

- Rock slope failure mechanisms
- Geological structure-controlled instability
- Slope monitoring technologies
- Stabilization and reinforcement techniques
- Risk assessment for open-pit mining and infrastructure slopes
- **Case Study:** Slope stabilization strategy for a large open-pit mine experiencing instability challenges.

Module 6: Numerical Modelling and Digital Rock Engineering

- Introduction to numerical modelling concepts
- Finite Element Method (FEM) and Discrete Element Method (DEM)
- Rock stress simulation techniques
- Data-driven geotechnical analysis
- Applications of AI and digital technologies in rock engineering
- **Case Study:** Numerical simulation of underground tunnel deformation and support optimization.

Module 7: Rock Engineering Risk Management and Monitoring

- Geotechnical hazard identification
- Rockburst and seismic risk assessment

- Real-time monitoring technologies
- Instrumentation and data interpretation
- Safety management systems
- **Case Study:** Use of microseismic monitoring to manage rockburst risks in underground mining.

Module 8: Sustainable Rock Engineering and Future Trends

- Sustainable mining and infrastructure development
- Climate resilience in geotechnical projects
- Automation and smart mining technologies
- Digital twins and predictive analytics
- Future innovations in rock engineering
- **Case Study:** Application of smart monitoring systems for sustainable underground mining operations.

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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