Numerical Modelling in Geomechanics Training Course

Professional Development Training Course Outline

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

Course Introduction

Numerical Modelling in Geomechanics is a cutting-edge discipline within geotechnical engineering, rock mechanics, and computational geosciences, focusing on the simulation of soil and rock behavior under various loading and boundary conditions. Numerical Modelling in Geomechanics Training Course provides a comprehensive understanding of finite element method, finite difference method, and discrete element method for solving complex geotechnical problems such as slope stability, tunnel excavation, underground mining, foundation design, and soil-structure interaction. Participants will gain hands-on exposure to industry-leading software platforms such as FLAC3D, PLAXIS, Abaqus, and RS2, enabling them to translate theoretical geomechanics into practical engineering solutions.

The course bridges the gap between theory and practice by emphasizing constitutive soil models, calibration techniques, parameter estimation, and real-world geotechnical case histories. It is designed to equip engineers with advanced capabilities in predictive modeling, risk assessment, and infrastructure resilience analysis. By integrating data-driven geotechnics, AI-enhanced simulation trends, and high-performance computing, the training prepares professionals to address modern challenges in mining engineering, tunneling projects, offshore foundations, and earthquake geotechnics.

Programme Curriculum

Numerical Modelling in Geomechanics Training Course

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Course Duration

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Course Objectives

1. Master numerical modelling techniques in geomechanics
2. Understand finite element and finite difference methods
3. Develop competency in soil and rock constitutive modelling
4. Perform slope stability and landslide analysis simulations
5. Analyze tunnel excavation and underground support systems
6. Evaluate soil-structure interaction under dynamic loading
7. Apply rock mass behavior and fracture mechanics principles
8. Conduct calibration and validation of geotechnical models
9. Use FLAC3D and PLAXIS for real-world simulations
10. Interpret geotechnical data for predictive modelling
11. Assess foundation performance in complex soil conditions
12. Model earthquake-induced ground deformation
13. Enhance skills in risk-based geotechnical design optimization

Target Audience

1. Geotechnical Engineers
2. Civil Engineers
3. Mining Engineers
4. Rock Mechanics Specialists
5. Tunnel and Underground Construction Engineers
6. Petroleum and Offshore Engineers
7. Engineering Geologists
8. Research Scholars and Graduate Students in Geomechanics

Course Modules

Module 1: Fundamentals of Numerical Geomechanics

- Basics of continuum mechanics in soils and rocks
- Stress-strain relationships in geotechnical materials
- Introduction to FEM, FDM, and DEM
- Mesh generation and boundary conditions

- Overview of geotechnical modelling workflow
- **Case Study:** Soil settlement prediction for building foundations in soft clay deposits

Module 2: Constitutive Models in Soil and Rock

- Linear and nonlinear material models
- Mohr-Coulomb and Hoek-Brown criteria
- Hardening soil and elastic-plastic models
- Parameter calibration techniques
- Laboratory vs field data interpretation
- **Case Study:** Rock mass classification for deep mining stability analysis

Module 3: Slope Stability and Landslide Modelling

- Limit equilibrium vs numerical methods
- Rainfall infiltration and pore pressure effects
- Factor of safety computation using FEM
- Sensitivity analysis of slope parameters
- Remediation and stabilization strategies
- **Case Study:** Highway slope failure prediction and mitigation design

Module 4: Tunnel and Underground Excavation Analysis

- Sequential excavation modelling techniques
- Shotcrete and rock bolt simulation
- Ground deformation and convergence analysis
- NATM and TBM tunnelling approaches
- Stress redistribution around openings
- **Case Study:** Metro tunnel excavation in urban soft ground conditions

Module 5: Foundations and Soil-Structure Interaction

- Shallow and deep foundation modelling
- Pile-soil interaction behavior
- Settlement prediction under loading
- Dynamic response of foundations
- Bearing capacity analysis using numerical tools
- **Case Study:** High-rise building pile foundation performance in reclaimed land

Module 6: Rock Mechanics and Mining Applications

- Jointed rock mass modelling
- Blast-induced vibration simulation
- Stope stability and mine design
- Caving and subsidence analysis
- Support system optimization
- **Case Study:** Underground hard rock mine stope stability evaluation

Module 7: Dynamic and Seismic Geomechanics

- Earthquake loading simulation
- Liquefaction modelling techniques

- Cyclic loading behavior of soils
- Seismic wave propagation analysis
- Dynamic amplification in structures
- **Case Study:** Earthquake-induced liquefaction failure in coastal soil deposits

Module 8: Advanced Simulation & AI in Geomechanics

- High-performance computing in geotechnics
- Coupled hydro-mechanical modelling
- AI and machine learning in prediction models
- Digital twins in geotechnical engineering
- Data-driven calibration techniques
- **Case Study:** Predictive landslide monitoring using sensor data and ML models

Training Methodology

- 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

Ready to enroll or request a customized program? Book online or contact us:

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