Advanced Soil Mechanics Training Course

Professional Development Training Course Outline

Category	Construction Institute	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Advanced Soil Mechanics Training Course provides professionals with the knowledge and analytical skills required to evaluate soil behaviour under complex loading and environmental conditions. This comprehensive training programme equips engineers, geotechnical specialists, construction professionals, and infrastructure planners with advanced competencies in geotechnical engineering, soil characterisation, foundation engineering, ground improvement technologies, slope stability analysis, finite element modelling, soil-structure interaction, numerical modelling, risk assessment, and sustainable geotechnical solutions. Participants will gain practical expertise through real-world engineering applications, laboratory data interpretation, and international design standards.

The course combines theoretical knowledge with practical engineering applications, enabling participants to solve challenging geotechnical problems encountered in highways, railways, dams, tunnels, offshore structures, mining, smart cities, renewable energy projects, and urban infrastructure developments. Emphasis is placed on AI-assisted geotechnical analysis, digital geotechnics, BIM integration, climate-resilient infrastructure, performance-based design, geotechnical monitoring, data-driven decision making, and international best practices. Numerous case studies ensure participants develop practical solutions for modern construction and infrastructure projects.

Programme Curriculum

Advanced Soil Mechanics Training Course

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Course Duration

10 days

Course Objectives

Upon completion of this training, participants will be able to:

1. Master advanced soil mechanics principles for complex geotechnical projects.
2. Analyse soil behaviour under static, cyclic, and dynamic loading conditions.
3. Perform advanced site investigation and subsurface characterisation.
4. Apply modern ground improvement technologies for challenging soils.
5. Evaluate foundation engineering solutions for high-rise and industrial structures.
6. Conduct slope stability analysis using analytical and numerical methods.
7. Design safe and economical earth retaining structures.
8. Implement finite element modelling (FEM) for geotechnical engineering applications.
9. Assess soil-structure interaction for infrastructure and transportation projects.
10. Integrate BIM and Digital Twin technologies into geotechnical engineering workflows.
11. Apply AI-powered geotechnical data analytics and predictive modelling techniques.
12. Develop climate-resilient and sustainable geotechnical solutions.
13. Manage geotechnical risk assessment, monitoring, and quality assurance throughout project lifecycles.

Target Audience

- Geotechnical Engineers
- Civil Engineers
- Structural Engineers
- Highway and Transportation Engineers
- Construction Project Managers
- Mining and Tunnel Engineers
- Engineering Consultants and Researchers
- Government Infrastructure and Regulatory Professionals

Course Modules

Module 1: Fundamentals of Advanced Soil Mechanics

- Soil composition and engineering properties
- Effective stress principles

- Stress paths and pore water pressure
- Critical State Soil Mechanics
- International design standards
- **Case Study:** Failure analysis of a high-rise foundation due to inadequate soil characterisation.

Module 2: Advanced Soil Classification and Characterisation

- Soil identification methods
- Laboratory testing techniques
- Index and engineering properties
- Soil profiling
- Digital soil databases
- **Case Study:** Geotechnical investigation for a metro rail project.

Module 3: Stress Distribution and Settlement Analysis

- Elastic theory
- Consolidation settlement
- Immediate settlement
- Secondary compression
- Numerical settlement prediction
- **Case Study:** Settlement monitoring for an airport runway expansion.

Module 4: Shear Strength and Failure Mechanisms

- Mohr-Coulomb theory
- Critical state concepts
- Triaxial testing
- Direct shear testing
- Failure envelopes
- **Case Study:** Industrial warehouse foundation failure investigation.

Module 5: Advanced Site Investigation

- Borehole planning
- Cone Penetration Testing (CPT)
- Standard Penetration Test (SPT)
- Geophysical investigations
- Field instrumentation
- **Case Study:** Offshore wind farm site investigation.

Module 6: Foundation Engineering

- Shallow foundations
- Deep foundations
- Raft foundations
- Pile load testing
- Foundation optimisation
- **Case Study:** Foundation design for a skyscraper.

Module 7: Earth Pressure and Retaining Structures

- Active and passive pressures
- Retaining wall design
- Reinforced earth systems
- Sheet pile walls
- Anchored retaining systems
- **Case Study:** Urban excavation support system.

Module 8: Slope Stability Engineering

- Natural slopes
- Engineered slopes
- Limit equilibrium methods
- Numerical analysis
- Landslide mitigation
- **Case Study:** Highway landslide remediation project.

Module 9: Ground Improvement Techniques

- Soil stabilisation
- Deep soil mixing
- Vibro-compaction
- Stone columns
- Geosynthetics
- **Case Study:** Soft ground improvement for an industrial park.

Module 10: Soil Dynamics and Earthquake Engineering

- Dynamic soil properties
- Liquefaction assessment
- Seismic site response
- Machine foundations
- Earthquake-resistant design
- **Case Study:** Seismic evaluation of a bridge foundation.

Module 11: Numerical Modelling and Finite Element Analysis

- FEM fundamentals
- PLAXIS applications
- MIDAS GTS
- GeoStudio modelling
- Model validation
- **Case Study:** Tunnel excavation numerical simulation.

Module 12: Geotechnical Instrumentation and Monitoring

- Settlement monitoring
- Inclinometers
- Piezometers
- Remote sensing
- Real-time monitoring systems
- **Case Study:** Smart monitoring of a large embankment dam.

Module 13: Sustainable and Climate-Resilient Geotechnics

- Green construction practices
- Carbon reduction strategies
- Sustainable foundations
- Climate adaptation
- Environmental impact assessment
- **Case Study:** Sustainable coastal protection infrastructure.

Module 14: AI, Digital Geotechnics and BIM Integration

- Artificial Intelligence in geotechnics
- Machine learning applications
- BIM workflows
- Digital Twins
- Predictive maintenance
- **Case Study:** AI-assisted prediction of ground settlement in urban tunnelling.

Module 15: Integrated Geotechnical Project Management

- Geotechnical risk management
- Quality assurance and control
- Contract management
- International codes and compliance
- Project optimisation
- **Case Study:** End-to-end geotechnical management of a mega infrastructure project.

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	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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