Soil Structure Interaction (SSI) 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

Soil Structure Interaction (SSI) Training Course provides advanced knowledge and practical skills in understanding the complex relationship between geotechnical engineering, structural dynamics, foundation systems, and seismic response analysis. Modern infrastructure projects increasingly demand accurate prediction of foundation behavior, ground structure response, settlement control, and structural performance under static and dynamic loading conditions. This comprehensive program introduces participants to advanced SSI concepts, including soil stiffness evaluation, foundation impedance, seismic soil response, finite element modeling, and performance-based design approaches.

Designed for engineers, researchers, and technical professionals, this course combines theoretical principles, numerical simulation techniques, industry standards, and real-world case studies to develop expertise in solving challenging foundation and structural interaction problems. Participants will gain practical exposure to advanced geotechnical modeling, earthquake-resistant design, nonlinear analysis, and smart infrastructure solutions used in modern civil engineering projects worldwide.

Programme Curriculum

Soil Structure Interaction (SSI) Training Course

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Course Objectives

By the end of this Soil–Structure Interaction Training Course, participants will be able to:

1. Understand advanced principles of soil–structure interaction mechanisms and their impact on infrastructure performance.
2. Analyze foundation stiffness, damping characteristics, and soil response behavior under different loading conditions.
3. Apply modern geotechnical engineering methodologies for SSI assessment and design optimization.
4. Evaluate static and dynamic interaction effects between soil, foundations, and superstructures.
5. Perform seismic SSI analysis for earthquake-resistant infrastructure design.
6. Develop competency in finite element modeling (FEM) and numerical simulation techniques.
7. Interpret soil investigation data for accurate foundation–ground interaction analysis.
8. Apply advanced foundation design concepts including shallow and deep foundation systems.
9. Understand nonlinear soil behavior and constitutive modeling techniques.
10. Improve structural safety through performance-based engineering approaches.
11. Analyze case studies involving bridges, high-rise buildings, tunnels, and industrial facilities.
12. Integrate digital engineering, BIM, and computational tools into SSI workflows.
13. Implement sustainable and resilient solutions using next-generation geotechnical technologies.

Target Audience

1. Geotechnical Engineers
2. Structural Engineers
3. Civil Engineering Consultants
4. Foundation Design Specialists
5. Earthquake Engineering Professionals
6. Construction Project Managers
7. Infrastructure Development Engineers
8. Academic Researchers and Engineering Students

Course Modules

Module 1: Fundamentals of Soil–Structure Interaction

- Introduction to **SSI principles and advanced geotechnical concepts**
- Soil properties affecting structural response
- Interaction between **foundation systems and surrounding soil media**
- Static and dynamic SSI behavior
- Importance of SSI in modern infrastructure design

- **Case Study:** Analysis of SSI effects on a high-rise building foundation system and comparison between fixed-base and flexible-base structural models.

Module 2: Soil Behavior and Geotechnical Characterization

- Advanced soil investigation techniques
- Soil stiffness, strength, and deformation characteristics
- Laboratory and field testing methods
- Soil constitutive models for engineering analysis
- Ground improvement considerations in SSI applications
- **Case Study:** Evaluation of soil parameters for a large transportation infrastructure project involving weak ground conditions.

Module 3: Foundation Systems and Interaction Mechanisms

- Shallow foundation and deep foundation interaction
- Raft, pile, and piled-raft foundation behavior
- Load transfer mechanisms between soil and structures
- Settlement prediction and control strategies
- Foundation optimization techniques
- **Case Study:** SSI assessment of a piled foundation system supporting a commercial tower development.

Module 4: Dynamic Soil–Structure Interaction Analysis

- Dynamic loading and vibration response
- Soil damping and foundation impedance functions
- Frequency-domain and time-domain analysis
- Machine foundation vibration assessment
- Advanced structural response prediction
- **Case Study:** Dynamic SSI evaluation for an industrial facility subjected to equipment-induced vibrations.

Module 5: Seismic Soil–Structure Interaction

- Earthquake ground motion effects on structures
- Seismic SSI modeling approaches
- Liquefaction assessment and mitigation
- Nonlinear soil response under seismic loading
- Earthquake-resistant foundation design
- **Case Study:** Seismic SSI analysis of a reinforced concrete building located in a high-risk earthquake zone.

Module 6: Numerical Modeling and Simulation Tools

- Finite Element Method (FEM) applications in SSI
- Numerical modeling workflow and calibration
- Advanced software-based SSI simulations
- Boundary conditions and mesh optimization
- Data interpretation and engineering validation
- **Case Study:** Finite element simulation of soil–foundation interaction using advanced computational modeling techniques.

Module 7: SSI Applications in Infrastructure Projects

- SSI considerations for bridges and highways
- Tunnel and underground structure interaction
- Offshore and marine foundation systems
- Smart infrastructure monitoring
- Risk-based design approaches
- **Case Study:** Bridge foundation SSI evaluation under combined traffic, environmental, and seismic loading conditions.

Module 8: Advanced SSI Design Strategies and Future Trends

- Performance-based SSI design
- Artificial intelligence in geotechnical engineering
- Digital twins for infrastructure monitoring
- Sustainable foundation engineering solutions
- Future innovations in resilient infrastructure
- **Case Study:** Application of AI-based predictive modeling for optimizing foundation performance.

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
21 Sep 2026	25 Sep 2026	Online	$1,000
21 Sep 2026	25 Sep 2026	Physical	$1,500
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0
21 Sep 2026	25 Sep 2026	Physical	$0

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