Performance-Based Structural Design Training Course

Professional Development Training Course Outline

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

Course Introduction

Performance-Based Structural Design (PBSD) is a modern engineering approach that focuses on ensuring structures achieve predefined performance objectives under various loading conditions such as earthquakes, wind, blasts, and extreme environmental forces. Unlike traditional prescriptive design methods, PBSD emphasizes structural resilience, ductility, safety optimization, and lifecycle performance, enabling engineers to design buildings that are not only code-compliant but also economically efficient, disaster-resilient, and sustainability-driven.

Performance-Based Structural Design Training Course provides a comprehensive foundation in advanced structural analysis, nonlinear behavior modeling, seismic performance evaluation, finite element simulation, and risk-based design optimization. Participants will gain hands-on expertise in applying performance-based seismic design (PBSD), progressive collapse resistance, structural health monitoring, and reliability-based engineering principles. The program integrates real-world case studies, international standards (ASCE 41, FEMA 356, Eurocode 8), and cutting-edge simulation tools to prepare engineers for high-performance infrastructure design in modern urban environments.

Programme Curriculum

Performance-Based Structural Design Training Course

Introduction

Performance-Based Structural Design (PBSD) is a modern engineering approach that focuses on ensuring structures achieve predefined performance objectives under various loading conditions such as earthquakes, wind, blasts, and extreme environmental forces. Unlike traditional prescriptive design methods, PBSD emphasizes structural resilience, ductility, safety optimization, and lifecycle performance, enabling engineers to

design buildings that are not only code-compliant but also economically efficient, disaster-resilient, and sustainability-driven.

Performance-Based Structural Design Training Course provides a comprehensive foundation in advanced structural analysis, nonlinear behavior modeling, seismic performance evaluation, finite element simulation, and risk-based design optimization. Participants will gain hands-on expertise in applying performance-based seismic design (PBSD), progressive collapse resistance, structural health monitoring, and reliability-based engineering principles. The program integrates real-world case studies, international standards (ASCE 41, FEMA 356, Eurocode 8), and cutting-edge simulation tools to prepare engineers for high-performance infrastructure design in modern urban environments.

Course Duration

5 days

Course Objectives

1. Understand Performance-Based Structural Engineering principles
2. Apply nonlinear structural analysis techniques
3. Develop seismic resilience design strategies
4. Evaluate structural damage states and performance levels
5. Implement risk-based design optimization methods
6. Master finite element modeling for complex structures
7. Analyze earthquake-induced structural behavior
8. Design for progressive collapse prevention
9. Integrate building performance objectives with safety codes
10. Apply structural reliability and uncertainty modeling
11. Use advanced simulation tools (ETABS, SAP2000, ANSYS)
12. Assess retrofit strategies for existing structures
13. Enhance sustainable and resilient infrastructure design

Target Audience

1. Structural Engineers
2. Civil Engineers
3. Construction Project Managers
4. Architects involved in structural planning
5. Geotechnical Engineers
6. Infrastructure Consultants
7. Government Building Code Officials
8. Graduate Engineering Students & Researchers

Course Modules

Module 1: Fundamentals of Performance-Based Design

- Introduction to PBSD framework
- Comparison with conventional design methods
- Performance objectives and criteria
- Structural demand vs capacity concept
- Code frameworks (FEMA, ASCE 41)

- **Case Study:** Earthquake performance assessment of mid-rise residential building in seismic zone

Module 2: Structural Dynamics & Seismic Response

- Dynamic loading principles
- Earthquake ground motion characteristics
- Modal analysis techniques
- Damping and resonance effects
- Response spectrum analysis
- **Case Study:** Seismic response of high-rise building during major earthquake simulation

Module 3: Nonlinear Structural Analysis

- Material nonlinearity behavior
- Geometric nonlinearity effects
- Push-over analysis techniques
- Hysteretic behavior modeling
- Failure mechanism prediction
- **Case Study:** Collapse mechanism analysis of reinforced concrete frame structure

Module 4: Performance Levels & Damage Assessment

- Operational, Immediate Occupancy, Life Safety, Collapse Prevention
- Drift limits and deformation criteria
- Damage indices evaluation
- Post-earthquake usability assessment
- Structural performance grading
- **Case Study:** Post-earthquake evaluation of commercial complex structural safety

Module 5: Seismic Design Optimization

- Performance-based seismic design workflow
- Base isolation systems
- Energy dissipation devices
- Structural redundancy planning
- Cost-performance optimization
- **Case Study:** Seismic retrofitting of hospital building using base isolation system

Module 6: Finite Element Modeling & Simulation

- Modeling complex structural systems
- Load application techniques
- Mesh generation and validation
- Interpretation of simulation outputs
- Software-based structural verification
- **Case Study:** FEM simulation of bridge pier under cyclic loading

Module 7: Structural Retrofit & Rehabilitation

- Assessment of existing structures
- Strengthening techniques
- Retrofit design strategies

- Life extension methodologies
- Performance upgrading techniques
- **Case Study:** Retrofit of aging school building for seismic safety compliance

Module 8: Advanced Risk & Reliability Engineering

- Probabilistic structural analysis
- Uncertainty modeling
- Failure probability estimation
- Risk-informed decision making
- Lifecycle structural performance
- **Case Study:** Risk-based assessment of urban infrastructure network under multi-hazard conditions

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

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

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com