Structural Health Monitoring (SHM) 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

Structural Health Monitoring (SHM) is a cutting-edge engineering discipline focused on the real-time assessment, diagnosis, and lifecycle management of civil and mechanical structures using advanced sensors, data analytics, and intelligent monitoring systems. With the rapid rise of smart infrastructure, IoT-enabled sensing, AI-driven predictive maintenance, and digital twin technologies, SHM has become a critical pillar in ensuring structural safety, resilience, and sustainability across bridges, buildings, dams, offshore platforms, and transportation systems.

Structural Health Monitoring (SHM) Training Course provides a comprehensive and practical foundation in modern Structural Health Monitoring systems, integrating vibration analysis, non-destructive testing (NDT), machine learning algorithms, wireless sensor networks, and cloud-based monitoring platforms. Participants will gain hands-on expertise in designing, implementing, and interpreting SHM systems aligned with global standards and industry best practices. The course is tailored to address the growing demand for smart infrastructure monitoring, predictive failure detection, and asset integrity management in today’s data-driven engineering environment.

Programme Curriculum

Structural Health Monitoring (SHM) Training Course

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Course Duration

5 days

Course Objectives

1. Understand fundamentals of Structural Health Monitoring (SHM) systems
2. Apply real-time structural damage detection techniques
3. Design IoT-based smart sensing networks for infrastructure
4. Analyze vibration-based condition monitoring data
5. Implement machine learning for predictive structural failure
6. Utilize digital twin technology in structural diagnostics
7. Integrate non-destructive testing (NDT) with SHM systems
8. Develop cloud-based structural monitoring dashboards
9. Apply signal processing techniques for structural data
10. Enhance bridge and building safety assessment strategies
11. Evaluate fatigue, stress, and deformation behavior of structures
12. Implement wireless sensor networks (WSN) in civil engineering
13. Improve asset lifecycle management using smart analytics

Target Audience

1. Civil Engineers & Structural Engineers
2. Mechanical & Aerospace Engineers
3. Infrastructure Project Managers
4. Bridge & Highway Maintenance Authorities
5. Oil & Gas Structural Integrity Engineers
6. Smart City & Urban Development Planners
7. Research Scholars in Civil Engineering & AI Systems
8. Government Infrastructure & Safety Regulators

Course Modules

Module 1: Fundamentals of Structural Health Monitoring

- SHM system architecture and components
- Types of structural monitoring systems
- Sensor technologies overview
- Data acquisition principles
- Introduction to damage detection concepts
- **Case Study:** Monitoring of a long-span suspension bridge under dynamic loading conditions.

Module 2: Sensors and Data Acquisition Systems

- Accelerometers, strain gauges, fiber optic sensors
- Wireless sensor networks (WSN)
- Signal conditioning and data logging
- Sensor placement optimization
- Calibration and noise reduction techniques
- **Case Study:** Sensor deployment in high-rise earthquake-resistant buildings.

Module 3: Vibration Analysis & Signal Processing

- Time and frequency domain analysis
- Fast Fourier Transform (FFT) applications
- Modal analysis techniques
- Noise filtering methods
- Damage signature identification
- **Case Study:** Vibration-based health monitoring of a railway bridge.

Module 4: Machine Learning in SHM

- Supervised and unsupervised learning models
- Anomaly detection algorithms
- Predictive maintenance modeling
- Neural networks for damage prediction
- Feature extraction from structural data
- **Case Study:** AI-based crack detection in concrete structures.

Module 5: Digital Twin Technology

- Concept of structural digital twins
- Real-time simulation models
- Integration with IoT data
- Predictive lifecycle analysis
- Virtual testing environments
- **Case Study:** Digital twin of a smart airport terminal structure.

Module 6: Non-Destructive Testing (NDT) Integration

- Ultrasonic and radiographic testing
- Thermal imaging techniques
- Acoustic emission monitoring
- Corrosion detection methods
- Hybrid SHM-NDT systems
- **Case Study:** Pipeline integrity assessment in offshore oil platforms.

Module 7: Cloud Computing & Data Visualization

- Cloud-based SHM platforms
- Real-time dashboards and analytics
- Big data handling for infrastructure
- Data security and storage systems
- Visualization tools for decision-making

- **Case Study:** Smart city bridge monitoring using cloud dashboards.

Module 8: Structural Failure Prediction & Risk Management

- Fatigue and fracture mechanics
- Risk-based inspection planning
- Structural reliability analysis
- Early warning systems
- Maintenance optimization strategies
- **Case Study:** Predictive failure analysis of aging highway bridges.

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:

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