

Offshore Structural Digital Twin

COURSE CONTENT

GET IN TOUCH



Multisoft Systems
B - 125, Sector - 2, Noida



(+91) 9810-306-956



info@multosoftsystems.com



www.multosoftsystems.com

About Multisoft

Train yourself with the best and develop valuable in-demand skills with Multisoft Systems. A leading certification training provider, Multisoft collaborates with leading technologies to bring world-class one-on-one and certification training. Intending to empower professionals and businesses across the globe, we offer more than 1500 training courses, which are delivered by Multisoft's global subject matter experts. We offer tailored corporate training, a comprehensive learning solution with lifetime e-learning access, after-training support and globally recognized training certificates.

About Course

The Offshore Structural Digital Twin Training focuses on integrating structural models with sensor, inspection, environmental, and operational data for effective offshore asset monitoring. Participants learn structural health monitoring, condition assessment, integrity analytics, anomaly detection, and visualization to support informed inspection, maintenance, and lifecycle decisions.

Module 1: Introduction to Offshore Structural Digital Twins

- ✓ Concept of digital twins in offshore engineering
- ✓ Physical asset and virtual asset relationship
- ✓ Evolution from conventional structural models to digital twins
- ✓ Digital twin maturity levels
- ✓ Digital models, digital shadows, and digital twins
- ✓ Offshore asset lifecycle and digitalization
- ✓ Key components of an offshore structural digital twin
- ✓ Engineering and business applications
- ✓ Digital twin implementation challenges

Module 2: Offshore Structures and Structural Integrity Fundamentals

- ✓ Overview of offshore structural systems
- ✓ Fixed offshore platforms
- ✓ Jackets, topsides, and foundation systems
- ✓ Floating offshore structures
- ✓ Structural members, joints, and connections
- ✓ Offshore structural load paths
- ✓ Structural integrity management principles
- ✓ Degradation mechanisms in offshore environments
- ✓ Corrosion, fatigue, cracking, and structural damage
- ✓ Lifecycle considerations for ageing offshore assets

Module 3: Digital Twin Architecture and Lifecycle Framework

- ✓ Digital twin architecture fundamentals
- ✓ Physical, virtual, and data layers
- ✓ Communication and integration layers
- ✓ Engineering information architecture
- ✓ Asset hierarchy and structural decomposition
- ✓ Digital thread concepts
- ✓ Lifecycle information management
- ✓ Interoperability between engineering systems
- ✓ Digital twin maturity and implementation roadmap
- ✓ Data governance considerations

Module 4: Structural Modelling and Digital Representation

- ✓ Creating digital representations of offshore structures
- ✓ Geometry and structural configuration
- ✓ Structural member modelling
- ✓ Material properties and section definitions
- ✓ Boundary conditions and support modelling
- ✓ Foundation representation
- ✓ Finite element model concepts
- ✓ Model simplification and idealization
- ✓ Structural model verification
- ✓ Baseline structural model development
- ✓ Connecting engineering models with digital twin environments

Module 5: Environmental and Operational Load Modelling

- ✓ Offshore environmental loading concepts
- ✓ Wave loading
- ✓ Current loading
- ✓ Wind loading
- ✓ Hydrostatic and hydrodynamic effects
- ✓ Operational loads
- ✓ Equipment and topside loading
- ✓ Marine growth considerations
- ✓ Load combinations
- ✓ Extreme and operational environmental conditions
- ✓ Environmental data integration into digital twin models
- ✓ Time-varying load representation

Module 6: Sensors, Instrumentation and Structural Health Monitoring

- ✓ Structural health monitoring fundamentals
- ✓ Offshore monitoring strategies
- ✓ Strain measurement
- ✓ Accelerometers and vibration monitoring
- ✓ Displacement and inclination monitoring
- ✓ Corrosion monitoring systems
- ✓ Fatigue monitoring
- ✓ Environmental sensors
- ✓ Sensor positioning considerations

- ✓ =Sampling frequency and measurement quality
- ✓ Sensor reliability and calibration
- ✓ Structural response monitoring
- ✓ SHM data within a digital twin framework

Module 7: Data Acquisition, Integration and Management

- ✓ Offshore data acquisition architecture
- ✓ Sensor data collection
- ✓ Inspection and survey data
- ✓ Operational data integration
- ✓ Environmental data sources
- ✓ Historical engineering information
- ✓ Data synchronization
- ✓ Time-series data management
- ✓ Data validation and quality control
- ✓ Missing and inconsistent data
- ✓ Data transformation and preprocessing
- ✓ Engineering database integration
- ✓ Cloud and edge concepts for offshore digital twins
- ✓ Maintaining traceability of engineering information

Module 8: Structural Analysis and Digital Twin Model Updating

- ✓ Structural response analysis

- ✓ Static and dynamic response concepts
- ✓ Stress and deformation assessment
- ✓ Modal characteristics
- ✓ Vibration response
- ✓ Comparing measured and analytical responses
- ✓ Model calibration
- ✓ Parameter identification
- ✓ Updating material and structural properties
- ✓ Updating boundary conditions
- ✓ Model correlation techniques
- ✓ Incorporating inspection findings
- ✓ Updating the digital twin after structural modifications
- ✓ Maintaining an evolving structural representation

Module 9: Condition Monitoring, Damage Detection and Integrity Assessment

- ✓ Condition-based structural assessment
- ✓ Baseline and current-condition comparison
- ✓ Structural anomaly identification
- ✓ Damage indicators
- ✓ Corrosion and thickness loss representation
- ✓ Crack and defect information
- ✓ Member and joint condition assessment
- ✓ Structural response changes
- ✓ Damage localization concepts

- ✓ Inspection data correlation
- ✓ Structural utilization monitoring
- ✓ Integrity status visualization
- ✓ Engineering interpretation of detected anomalies
- ✓ Supporting integrity decisions through digital twins

Module 10: Predictive Analytics and Remaining Life Assessment

- ✓ Introduction to predictive structural analytics
- ✓ Historical data analysis
- ✓ Trend identification
- ✓ Structural degradation modelling
- ✓ Fatigue accumulation concepts
- ✓ Fatigue damage monitoring
- ✓ Corrosion progression
- ✓ Remaining fatigue life assessment
- ✓ Remaining useful life concepts
- ✓ Forecasting structural condition
- ✓ Threshold and alert concepts
- ✓ Uncertainty in prediction
- ✓ Risk-informed forecasting
- ✓ Supporting proactive integrity management

Module 11: Inspection, Maintenance and Asset Integrity Integration

- ✓ Offshore inspection management
- ✓ Inspection data integration with structural models
- ✓ Visual inspection information
- ✓ NDT data considerations
- ✓ Inspection history management
- ✓ Risk-based inspection concepts
- ✓ Condition-based maintenance
- ✓ Maintenance prioritization
- ✓ Structural repair information
- ✓ Tracking modifications and repairs
- ✓ Asset integrity management workflows
- ✓ Inspection planning using digital twin information
- ✓ Engineering decision support
- ✓ Lifecycle integrity records

Module 12: Digital Twin Implementation Workflow and Practical Case Study

- ✓ Defining digital twin objectives
- ✓ Identifying critical offshore structural assets
- ✓ Establishing asset hierarchy
- ✓ Creating the baseline structural model
- ✓ Selecting monitoring parameters
- ✓ Sensor and inspection data mapping

- ✓ Integrating operational and environmental information
- ✓ Establishing data quality procedures
- ✓ Model calibration and updating workflow
- ✓ Structural condition assessment
- ✓ Integrity indicators and engineering dashboards
- ✓ Predictive assessment workflow
- ✓ Inspection and maintenance decision support
- ✓ Digital twin validation
- ✓ Managing updates throughout the asset lifecycle
- ✓ Practical offshore structural digital twin scenario
- ✓ Interpretation of structural condition information
- ✓ Digital twin implementation challenges and lessons learned