

Model-Based Systems Engineering (MBSE) Training

Length: 3 Days

Summary: MBSE Training, Model-Based Systems Engineering (MBSE), covers the formalized application of modeling to support systems analysis, use cases, requirements, design, analysis, verification, and validation activities. This course covers the process that begins with the conceptual design phase and continues throughout development and later life cycle phases. This course will show the modeling capabilities of MBSE to link all elements of your system to have greater visibility into your design, verification and validation. Learn how SysML used to model structure and behavior of dynamic systems.

MBSE can manage the development and deployment of complex systems without ad-hoc collections of independent documents. MBSE with SysML includes a general-purpose graphical modeling technique for specifying, analyzing, designing, and verifying complex systems that may include hardware, software, information, personnel, procedures, and facilities.

SysML provides graphical representations with a semantic foundation for modeling system requirements, behavior, structure, and parametric equations that can integrate with a broad range of engineering analysis.

Learning Objectives:

- ✓ Understand what MBSE is
- ✓ Describe how MBSE supports systems engineering processes
- ✓ Recognize the various types of MBSE methodologies
- ✓ Apply MBSE knowledge in your day-to-day SE work
- ✓ Understand what SysML is
- ✓ Learn about SysML diagrams
- ✓ Learn the benefits of implementing MBSE and SysML in a modeling environment and tools
- ✓ Understand SysML fundamental constructs
- ✓ Describe how SysML fits with related MBE/MBSE technologies
- ✓ Discover the benefits of a SysML-based MBE/MBSE approach
- ✓ Create a plan to deploy MBSE and SysML technologies in your organization

COURSE CONTENT

1. What is Systems Engineering?

- What is System Thinking?
- Applying Systems Thinking to Systems Design
- Avoiding Poor Design
- Entities
- Attributes
- Relationships
- Integrated requirements management
- Capture customer needs accurately
- Architecture development
- Subsystems and components
- Validation and Verification
- Highlights gaps and missing functions

2. SE Practices for Describing Systems

- Motivation for Systems Engineering
- Systems Engineering Process
- Systems Engineering Method
- Specifications
- Interface requirements
- System design
- Analysis & Trade-off
- Test plans
- System Modeling Activities
- Integrating MBSE into the SE Process
- System Development Process
- Moving from Document centric to Model centric

3. Model-based systems engineering (MBSE)

- Definition of Model-Based Systems Engineering (MBSE)
- System Model
- Contrasting Document-Based SE with MBSE
- Purpose for Modeling a System
- Requirements for a systems engineering process
- What is a model?
- An Integrating framework for the Systems Engineering
- MBSE definitions
- MBSE benefits and advantages
- Unlocking the power of MBSE
- Requirements
- Behavior
- Communication
- Four elements of a model
- Characteristics of a model
- System modeling language
- Modeling the behavior
- Structure and system relationships
- the model and concept of the design
- MBSE Methodologies
- MBSE model and system definition language
- Modeling languages and information standards
- UML
- SysML

4. MBSE Across the System Life Cycle

- MBSE 's role to facilitate traditional SE activities
- Specification and design precision
- System design integration
- Re-use of system artifacts
- Output of MBSE as a system model
- Model Requirements
- Model Analysis and Design
- Model Simulation
- Model Code
- Model Test
- Simple Model Construction
- Requirements, functions, and components
- Modeling Notations
- Integrated graphical views
- Hierarchies
- Functional flow and enhanced functional flows
- N2
- IDEF0
- Physical block
- Systems Engineering Solutions

- Robust and agile analysis
- Requirements definition through architecture to systems verification
- End-to-end traceability
- Extensive behavioral modeling representing control flow, function flow, and interface flow
- System simulations
- Behavioral models
- Integrated Model-Based
- Model Based Operational and System Architecture
- Languages, Processes, Tools and architecture frameworks

5. Overview of SysML

- Introduction to the OMG Systems Modeling Language (OMG SysML™)
- 4 Pillars of SysML
- SysML Diagram Types
- SysML Diagrams
- Package diagram
- Requirement diagram
- Use Case diagram
- Block Definition diagram
- Internal Block diagram
- Activity diagram
- Sequence diagram
- State Machine diagram
- Parametric diagram

6. Modeling with SysML

- Using SysML in Support of MBSE
- Modeling Functionality with Use Cases
- Modeling Requirements and their Relationships
- Modeling Structure with Blocks (Block Definition Diagrams)
- Modeling Structure with Blocks (Internal Block Diagrams)
- Modeling Flow-Based Behavior with Activities
- Modeling Event-Based Behavior with State Machines
- Modeling Message-Based Behavior with Interactions
- Modeling Constraints with Parametrics
- Modeling Cross-Cutting Relationships with Allocations

7. Working with MBSE Domains

- Architecting, specifying and developing complex systems
- Process Domain (SE activities)
- Source Requirements Domain
- Behavior Domain
- V&V Domain
- Architecture Domain

8. Workshops: Working with SysML Diagrams

- Block Definition Diagrams
- Internal Block Diagrams
- Use Case Diagrams
- Activity Diagrams
- Sequence Diagrams
- State Machine Diagrams
- Constraints and Parametric Diagrams
- Package Diagrams
- Requirements Diagrams
- Allocations

