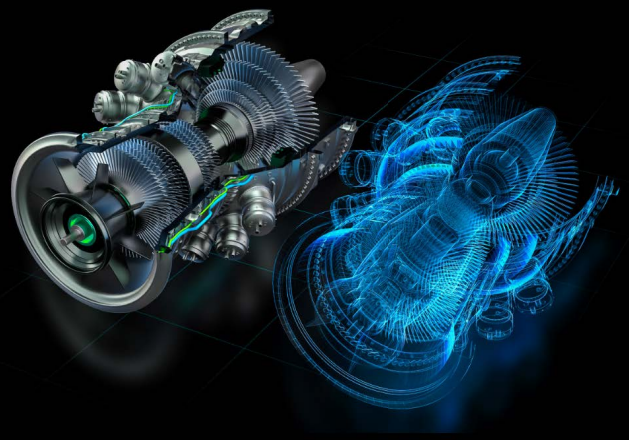
2-DAY COURSE

Model-Based Systems Engineering (MBSE) Foundations



Improve your engineering outcomes with the power of modeling

Why Model-Based Systems Engineering (MBSE)?

You wouldn't undertake a complex project, or even a simple one, without defining tasks, work products and dependencies. **Model-Based Systems Engineering (MBSE)** applies the same concepts to problem definition and technical solution development. MBSE revolutionizes the way we define, design, and deliver systems. MBSE uses problem domain and solution domain logical modeling to help get things right, in doing so avoiding expensive, time-consuming rework caused by developing the wrong thing, or by making errors trying to develop the right thing. For larger organizations or projects, MBSE may be extended to replace document-heavy processes with a "single source of record" engineering information model of broad scope within which the foundational logic of physical and logical modeling may reside.

In this two-day course, you'll learn **why MBSE matters**, **what it changes**, and **how to start applying it** in practical ways to real-world development.

Whether you're new to MBSE or looking to expand your existing knowledge, this course will give you the conceptual grounding and early hands-on experience of physical and logical modeling to make MBSE work for you and for your organization.

Earn CE/CPD Credit

This course qualifies for:

- 16 Professional Development Units (PDUs)

INCOSE CSEP Renewal

- 16 Continuing Education PDUs

PMI Talent Triangle® Suggested PDUs

- Ways of Working – 7
- Power Skills – 8
- Business Acumen – 1

Who Should Attend

This course is designed for:

- Engineers, regardless of technology discipline, role or application domain
- Project and program managers initiating or overseeing MBSE initiatives
- Business analysts, solution architects, and technical leaders
- Specialists in reliability, safety, maintainability, producibility and similar disciplines
- Anyone involved in complex systems projects seeking better ways to deal with requirements, design, system integration, verification or validation

No previous MBSE experience is needed. Some prior exposure to systems engineering concepts would be beneficial.

The focus of this course is on **concepts, methods, value, risk reduction** and **early practical application** rather than manipulation of tools.

20,000+ Professionals Trained Across 43 Countries

Key Learning Outcomes

By the end of this course, participants will:

- Understand the **core principles and objectives** of MBSE
- Identify the **value of MBSE** within problem definition and solution development
- Grasp the fundamentals of **logical modeling** to support requirements capture and validation
- Grasp the fundamentals of **logical modeling** to support system architectural and detailed design
- See how MBSE improves **stakeholder communication, traceability**, and **risk reduction**
- Recognize the **languages and representative tools** that enable MBSE
- Learn practical steps for **adopting MBSE** in your organization

Course Content Overview

Introduction to MBSE

- Why MBSE? The business case
- MBSE in the system development life cycle
- How MBSE improves requirements, design, and verification

Foundations of Logical Modeling

- Systems thinking revisited: from documents to models
- Key model types: functional, state-based, structure-based
- The relationship between physical and logical models

MBSE for Requirements Capture and Validation

- Using modeling to achieve adequate problem definition
- Workshops and exercises: including state-based and functional modeling

MBSE for System/Product Design

- Where do we start?
- Functional architectures and behavior modeling
- Allocating elements of logic to elements of structure
- What good modeling practices look like (and common pitfalls to avoid)
- Workshop and exercises: performing model-based design

MBSE Languages, and Tools

- Language options: proprietary and SysML 2
- Overview of major MBSE tool classes, tools and ecosystems

Starting Your MBSE Journey

- The role of MBSE in engineering
- Challenges and enablers for successful adoption
- Developing MBSE competencies and team capabilities

Training Method and Materials

This dynamic course combines:

- **Clear presentation** and discussions that demystify MBSE principles and concepts
- **Interactive exercises** that reinforce learning
- **In-depth workshops** to practice modeling techniques
- **Real-world examples** connecting theory to application
- **Group discussions** on practical challenges and solutions.

Participants will receive:

- A printed or digital **training manual**
- **Hands-on workshop exercises** with guided solutions
- Templates and checklists to **jump-start your MBSE practice**
- Complimentary access to PPI's **Systems Engineering Goldmine** and **Systems Engineering Tools Database**

Why Learn MBSE with PPI?

Our MBSE Foundations course **cuts through the hype** and **focuses on what matters: better requirements, better design, better results.**

"I enjoyed the course tremendously!"

— Course participant, Netherlands

PPI is globally recognized for delivering **deep systems engineering training** that produces **better engineers** (100%), **better projects** (98.3%) and **better companies** (93.5%). Over **20,000 professionals** across **43 countries** have benefited from PPI's training. You can too.

Model-Based Systems Engineering 2-Day Course Outline

1. Introduction – MBSE Within Systems Engineering

- The business case for MBSE within the system lifecycle
- Definition of terms
- Requirements capture and design interactive exercise – basic
- MBSE within a systems engineering process model
- Requirements Analysis – context, purpose, inputs, outputs
- Logical Design – context, purpose, inputs, outputs and types of logic – functional and state-based

2. MBSE for Requirements Capture and Validation

- MBSE within requirements capture and validation
- ***Workshop 1 – States and Modes Analysis***
- ***Workshop 2 – Functional Analysis***

3. Concepts of Architecture and Detailed Design – Physical and Logical

- MBSE within design
- Physical architecture (structural view) – basic concepts
- Functional form of logical architecture – basic concepts
- Functional architecture related to physical architecture
- Model-based design in practice – Model-Based Systems Engineering (MBSE)/Model-Based Architecting (MBA)/Model-Based Design (MBD)/ Model-Driven Design (MDD)

4. Initial Physical Conceptualization

- The role of technology and innovation
- Design complexity trade-off
- ***Interactive exercise – a simple physical design***

5. Functional Design

- Functional analysis in design – how to do it
  - Functional analysis/architecture process
  - Item flow and control flow
  - Un-allocatable and allocatable functions
  - Pitfalls in defining functions
  - Common pitfalls in functional design
  - ***Interactive exercise – a simple functional design***
  - ***Workshop 3 – physical and functional design, part A***
  - ***Workshop 3 – physical and functional design, part B (optional)***
  - Coupling, cohesion, connectivity
  - Failure Modes and Effects Analysis (FMEA)/Failure Modes, Effects and Criticality Analysis (FMECA) in design
  - Executable functional design
  - Performance thread analysis
- Allocation of functionality between hardware and software
- MBSE languages – SysML 1, SysML 2, proprietary languages
- Constructed simulations
- Software tools supporting functional and physical design
- Pitfalls in functional design

6. State-Based Design

- State-based design – language concepts
- SysML, and alternative languages incorporating state-based modeling
- Software tools supporting state-based design
- Pitfalls in state-based design

7. Summary and Key Points

- Action plan

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systems/product engineering training & consulting for project success ...

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