

# Applied Model-based Systems Engineering

A Hands-on Approach to Understanding the Processes, Practicalities and Potentials for your Projects

## Course Description

This 3-4 day tailorable course provides a broad introduction to the *what, why* and *how* of the processes, practices, tools and techniques that comprise the emerging discipline of model-based systems engineering (MBSE). The course makes extensive use of “learn by doing” through hands-on exercises. The focus is on six central themes that comprise the unique advantages MBSE offers—Capturing, Connecting, Controlling, Communicating, Collaborating and Cycling. The current state of modeling languages (UML, SysML, LML, and others), ontologies, architectural frameworks and tools are examined.

From this foundation, the course then focuses on examining each key part of systems engineering—Design, Manage, and Realize. Participants are guided through how to build a system model “from scratch” leveraging design patterns and other techniques. A “graduation exercise” asks participants to build their own model for a system of their choice.

## Who Should Attend

This course is intended for practicing systems engineers, payload principle investigators, subsystem engineers or project managers involved in any phase of the space mission life cycle who are curious about application of MBSE to their projects.

## Course Materials

Each participant will receive:

- A complete set of course notes with copies of all slides used in the presentations
- An e-copy of the *Applied Space Systems*

## Course Objectives

By the end of this course participants will be able to...

- ◆ **Define** model-based systems engineering and discuss its value proposition across the project lifecycle.
- ◆ **Recognize and explain** the use of SysML as well as other commonly used systems engineering diagrams and artifacts.
- ◆ **Given existing system details, apply** MBSE tools and techniques to build a basic system model that captures and communicates the design solution as well as key relationships.
- ◆ **Use** a system model to simulate system behavior.
- ◆ **Participate** in a simulated model-based Design Review to explore the application of MBSE to evaluate project technical maturity.
- ◆ **Using MBSE**, examine details about a system's structure and behavior to identify potential issues (i.e. gaps, omissions, overlaps, missing traceability, cause and effect, etc.) and propose fixes or improvements to the model.
- ◆ **Model** specific systems engineering artifacts such as requirements, functional architectures, and interface architectures using diagrams and other techniques across the Design, Manage and Realize lifecycle.
- ◆ **Build** your own integrated model.

## Courseware

- Innoslate cloud-based tool (free trial license). Internet access required.
- Cameo Enterprise Architect also available (Customer needs to provide own licenses).

## Course Topics

- ◆ **Foundations**
  - Introduction to Systems Engineering using Models
  - Innoslate Quick Start Guide
  - Ontologies, Languages and Frameworks
  - Solar Fan Exercise
- ◆ **MBSE Applications**
  - Design
  - Manage
  - Realize
- ◆ **MBSE Creation**
  - Introduction to MBSE Simulations
  - Design Patterns and Model Re-use
  - Software Modeling
  - Project and Configuration Management
  - Digital Threads and Digital Twins
  - Tool Selection Exercise
  - Building Your Own Model
  - Model Building “Graduation” Exercise

## Testimonials

*“Before this class I was completely unaware of what MBSE was and why it was important. But now I've learned what MBSE is and how to properly implement it in projects.”* - USAF Engineer

*“This was one of the best online implementation of a course I have been in. It was the perfect amount of discussion, lecture and hands on activity to gain proper understanding.”* - USAF Engineer

*“This training has open my mind to the endless possibilities using MBSE.”* - NOAA Engineer