

Applied Model-Based Systems Engineering

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

Course Description:

This 3-day course provides a broad overview of the processes, practices, tools and techniques that comprise the emerging discipline of model-based systems engineering (MBSE) with emphasis on practical application. The course begins with a review of the systems engineering framework and protocols that establish the context for MBSE practice. We then examine the evolution of MBSE from paper to software and review the current state of languages (UML, SYSML, LML, etc.) and tools. From this background, the basic goals of MBSE within a project context are discussed. The course then focuses on six central themes that comprise the unique advantages MBSE offers—Capturing, Connecting, Controlling, Communicating, Collaborating and Cycling—with specific examples, lessons learned from applications in NASA and commercial projects. The course makes extensive use of “learn by doing” through extensive hands-on exercises.

Course Objectives:

While the course uses a specific tool for teaching, the goal of the course is to be “tool agnostic” such that the basic principles can be applied to any tools that a person or project may use. By the end of this course participants will be able to...

- **Explain** the systems engineering framework and how we use it to develop technical baselines throughout the lifecycle.
- **Develop** key systems engineering diagrams and other artifacts to communicate requirements validation, system context, functional behavior, physical architecture, interfaces, risks and other information.
- **List** model-based systems engineering (MBSE) tools, **contrast** them with model-based engineering tools, and explain how they can be used to capture, connect, communicate, collaborate, control and cycle the systems engineering effort.
- **Identify** different modeling languages and **explain** their application
- **Describe** and give examples for the application of MBSE across the lifecycle, from goals, objectives and ConOps through verification planning.
- **Apply** MBSE tools to develop basic system models.

Course Topics

- **Foundations**
 - System Engineering Fundamentals
 - Introduction to MBSE and Tools
 - Introduction to Modeling Frameworks and Languages
 - MBSE Across the Lifecycle
- **Applied MBSE**
 - Modeling System Design
 - Modeling System Management
 - Modeling System Realization
- **MBSE Design and Analysis**
 - Deep Dive Modeling Frameworks and Languages
 - Tool Selection Techniques
- **NanoMET: A space system lifecycle case study (integrated throughout)**
- **Extensive Hands-on Exercises (integrated throughout)**

Course Materials

Each participant will receive:

- A complete set of course notes with copies of all slides used in the presentations
- A copy of *Applied Space Systems Engineering*
- TSTI Alumni status allowing on-line access to course materials and other resources

Courseware

- Hands-on with Innoslate cloud-based tool (free trial license). Internet access required.
- Cameo Enterprise Architect (free trial license)

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. Some basic understanding of systems engineering principles and processes is assumed.

