TEACHING SCIENCE AND TECHNOLOGY, INC.

Foundations of Digital Engineering

A Knowledge Framework for Digital Engineering Transformation

Course Description

Digital transformation looks good on a powerpoint slide—but difficult to implement. Many organizations invest in tools first before deciding on what questions digital engineering should answer or problems it should solve. The Foundations of Digital Engineering course equips you to make deliberate decisions about where digital capabilities add value—and where they don't.

The course introduces the Digital Trinity—Lean-Agile, Open Architectures, and Digital Engineering—and explains how they reinforce one another. MBSE is presented as the "model of the models"—a unifying discipline that connects engineering artifacts, enables traceability, and supports better lifecycle decisions. Ontologies, frameworks, and the challenge of defining an Authoritative Source of Truth are examined in practical, organizational terms.

Rather than promoting specific tools, the course focuses on judgment: how to assess maturity, prioritize investments, and guide digital transformation at a sustainable pace.

Are you being asked to "go digital" without a clear roadmap? Not sure how MBSE fits in to digital engineering? Responsible for shaping transformation rather than just implementing tools? This course is designed for project engineers and managers guiding digital engineering adoption in their organization.

Course Objectives

At the end of this course you should be able to…

- Compare and contrast analog engineering, traditional Digital Engineering and the value proposition for more fully integrated Digital Engineering ecosystems.
- Explain the elements of the Digital "Trinity" and how they relate to each other.
- Describe the Lifecycle Modeling Framework as a thinking tool to conceptualize integrated Digital engineering ecosystems.
- Understand the DoD DE Strategy goals and their associated metrics in the INCOSE maturity guide.
- Characterize types of engineering and project models and their application across the product lifecycle.
- Generalize the challenges and techniques for developing, integrating and curating models.
- Analyze approaches for using models to evaluate "digital threads" in a system.
- Explain the advantages of having an ASOT.
- Discuss the challenges of managing multiple sources of truth in a project.
- Describe the elements and requirements for an idealized Digital Engineering Ecosystem. Data sharing models?
- Evaluate current commercial DE ecosystem products.
- Discuss the potential applications for AI/ML to enhance the value of DE.
- Appreciate the IT requirements and challenges of establishing an integrated DE ecosystem across an enterprise.
- Recognize the value of agile techniques to accelerate the digital transformation in an organization (DevSecOps)
- Apply the INCOSE maturity metrics to evaluate the transformation state of your organization.
- Discuss plans of action to lead and support digital transformation including workforce development requirements.

Course Topics

- **Module 001—Introduction to Digital Engineering**
  - The "Digital Trinity"—Lean-Agile, Open Architectures, Digital Engineering
  - Lifecycle Modeling Framework
- **Module 010—Using Models and Defining the Truth**
  - Model-based Systems Engineering
  - Ontologies, Languages and Frameworks
  - Developing and Curating Models
  - Authoritative Source of Truth (ASOT)
- **Module 011—The Digital Enterprise**
  - Digital Ecosystems
  - Artificial Intelligence and Machine Learning
- **Module 100—Digital Environments**
  - IT Challenges
  - DevSecOps
- **Module 101—Transforming the Workforce**
  - INCOSE Maturity Metrics

Who Should Attend

Project Managers, Systems engineers, payload principle investigators, subsystem engineers or project managers who are participating in or responsible for digital transformation in their organization.

Testimonials

"Digital thread exercise gave first hand insight into the value of digital engineering to the organization." - USMC Engineer

"Key takeaway: the ability to link information is KEY to DE, and that we need to use the limited systems we have in place now to do MBSE." - USMC Engineer

"I learned…helpful processes and tools to focus on specific areas to improve." - USSF Engineer