



THIS MODULAR COURSE CAN BE TAKEN FOR GRADUATE CREDIT TOWARDS A MASTER'S IN SYSTEMS ENGINEERING OR AS PART OF A PROFESSIONAL DEVELOPMENT PROGRAM.

MODULE DESCRIPTION AND OBJECTIVES

This course provides a hands-on opportunity to apply key principles of space systems engineering. In the first part of the module, participants are given a set of customer expectations in the form of broad mission objectives. Using state-of-the-industry mission design and analysis tools, participants apply systems engineering processes to define top-level system requirements, design key elements and conclude with a Mission Concept Review. In the second part of the module, participants experience system realization processes first-hand by integrating, verifying, validating and delivering a shoe box-sized satellite system, EyasSaT™ (www.eyassat.com). From the part-level to the system-level participants implement a rigorous assembly, integration, verification & validation plan applying “test like you fly, fly like you test” principles.

MODULE ORGANIZATION

The course combines lectures, readings and hands-on exercises to develop an understanding of key concepts and principles of space system verification & validation. Participants are given the opportunity to apply verification & validation techniques and methods on a system of interest that emulates the functionality of a satellite. In this way, the differences between the theory and practice of verification & validation are highlighted and experienced first-hand.

MODULE AUDIENCE

This module addresses the verification & validation of space systems from the perspective of integrators, acquirers and users of these complex systems. It is intended for engineers, principal investigators and project managers who are responsible for the detailed design and/or verification of space systems.

COURSEWARE

Each participant will receive a complete set of course notes with copies of all slides used in the presentations.

MODULE DIRECTOR

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MODULE REGISTRATION & INFORMATION

To inquire about registering for this modular course, please contact Stevens SDOE Program Manager, at SDOE@stevens.edu.

Enrollment forms can be completed online via

www.stevens.edu/SDOEenroll

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For more information, visit the Stevens website at www.stevens.edu/SPACE

DAY 1

SESSION 1

Review of Space Systems Engineering – Introduction to Space Systems Engineering, Conceptual Space Mission Design, Course Project Description

SESSION 2

Mission Design Exercise Part 1 – Working in groups, apply space systems engineering principles and techniques to a real-world mission design problem. Course tools are introduced and explained. Examples from the FireSAT mission are introduced.

DAY 2

SESSION 3

Mission Design Exercise Part 2 – Working in groups, apply space systems engineering principles and techniques to a real-world mission design problem. Course tools are used. Examples from the FireSAT mission are continued.

SESSION 4

Mission Design Exercise Part 3 – Working in groups, apply space systems engineering principles and techniques to a real-world mission design problem. System Design Review is presented.

DAY 3

SESSION 5

Introduction to System Verification & Validation – Fundamentals of space systems engineering are reviewed. Basic principles of system verification & validation are introduced.

SESSION 6

Validation Requirements and Models – Approaches to validation system requirements and models are introduced and described. EyasSaT™, the course system of interest is introduced. Participants validate EyasSaT™ requirements and begin planning for EyasSaT™ verification.

DAY 4

SESSION 7

Product Verification – Product verification methods and techniques are introduced. Verification for the launch and space environment is described. Verification program planning is explained and examined. Participants conduct a verification planning exercise.

SESSION 8

COTS and Software Verification & Validation – Verification issues associated with Commercial Off The Shelf (COTS) and Non-developmental items (NDI) are discussed. Unique issues with software verification and validation are examined. Participants conduct part-level verification of EyasSaT™ hardware. Participants witness a demonstration of EyasSaT™ software calibration. Participants conduct verification and validation of EyasSaT™ software. Participants conduct verification of all other EyasSaT™ subsystems (electrical power, communications, command & data handling, attitude determination & control, and structures and integration subsystem)

DAY 5

SESSION 9

EyasSaT™ Integration, System-Level Verification & Validation – Participants integrate the EyasSaT™ system and conduct system-level verification activities along with validation methods.

SESSION 10

System Validation and Flight Certification, Wrap-up – Issues associated with system validation and certification for flight are examined. A System Acceptance Review for EyasSaT™ is conducted. Course wrap-up and critiques.