



**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 OBJECTIVE

It takes something special for the term "system" to have such ubiquity. The downside is that it is overused, improperly so, detracting from its power. This class builds upon a solid conceptual foundation to ensure that the system/enterprise is properly defined, conceived, and realized. Uniquely, the class shows how it is possible to use systems in order to think more deeply and to act more decisively. This approach is made possible by emphasizing the simultaneity of perspectives, the role of paradox, and the centrality of soft issues in resolving complexity. The SystemiTool™ is used to structure and conduct analysis of decisions. This class is aimed at policy and decision-makers at all levels in an organization. Prerequisites: SYS/SDOE 625 or ES/SDOE 621

### MODULE ORGANIZATION

In order to obtain deeper insight, case studies will be defined and executed in small groups. The case studies are designed to stimulate the usage of systems thinking and to gain insight into its relationship to change management and the life cycle of systems.

### MODULE AUDIENCE

The module is aimed at policy and decision-makers at all levels in an organization. This includes all business, engineering, scientific, and management related disciplines.

### COURSEWARE

All course participants will receive a copy of the textbook "Systems Thinking: coping with 21st century challenges" and module specific courseware that includes a free copy of a software product SystemiTool™ which is downloadable over the web.

### MODULE DIRECTOR

**Dr. John T. Boardman**, *Distinguished Research Professor*  
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### MODULE REGISTRATION & INFORMATION

For additional information:

Contact **Beth Austin DeFares**, bdefares@stevens.edu, 201.216.5362 or download the SDOE Graduate Enrollment Form from our website at [www.stevens.edu/SDOEenroll](http://www.stevens.edu/SDOEenroll) and fax it to 201.216.5080.

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[www.stevens.edu/sse](http://www.stevens.edu/sse)



### DAY 1

**SESSION 1 Perspectives** - Introductions. Case study illustrating interaction of perspectives such as technology innovation, business models and media landscape (e.g. Google, Inc.). Systems thinking precepts and mental exercises.

**SESSION 2 Systemigrams** – The role of system description languages in systems thinking. The structure, design and dynamics of systemigrams in capturing perspectives, issues and capabilities.

**SESSION 3 Small Group Studies** - Using the Systemigram description technique to capture strategic intent, e.g. USAF C2 Constellation.

### DAY 2

**SESSION 4 Systems Engineering** - The essence of Systems Engineering (SE) as seen through lifecycle models, phase reviews, requirements, stakeholders and trade-offs and including processes such as functional decomposition, functional and physical architecting, and extensibility scalability to complex systems engineering.

**SESSION 5 Soft Systems Methodology: SSM** - Simultaneous perspectives, root definitions, conceptual models, feasible and desirable change. A new perspective on human activity systems through Boardman SSM (BSSM), using systemigrams to conduct appreciative inquiry into perplexing issues.

**SESSION 6 Case study** - Using BSSM and Systemigrams, explore case study of Integrated Deepwater Logistics.

### DAY 3

**SESSION 7 System Concepts** - Introducing the Conceptagon™ and the fundamental ideas of boundary, emergence, hierarchy, parsimony and feedback.

**SESSION 8 System Dynamics** - Describing and applying causal loop diagrams; system archetypes, e.g. tragedy of the commons. Case study using causal loops, e.g. limits to growth of Google, Inc. or accidental adversaries in Joint Force Development.

### DAY 4

**SESSION 9 Frameworks** – Origins and survey of SE frameworks within organizations such as DoDAF, Treasury, Gartner Group. Fundamental principles of framework design. Comparative evaluations of SE and SSM frameworks.

### SESSION 10

**System of Systems (SoS)** – Literature survey of definitions and abstracting their essence. Characteristics distinguishing SoS from conventional systems. SoS case study, e.g. Google, Inc. or Intelligence Community applying these characteristics to future systems development.

### DAY 5

#### SESSION 11

**System Paradoxes** – Living with paradox in enterprise systems, e.g. cooperating with competitors. War as paradox, e.g. command and control versus creative disobedience.

#### SESSION 12

**Complex Adaptive Systems** – An in depth look at emergence, examining notions of self-organization and self-synchronicity. Course evaluation.