

# **Syllabus – SEOR Dept. Volgenau School of Engineering**

## **SYST 659 – 003 - Fall 2012**

### **Systems of Systems Engineering and Integration**

#### Course Description:

We discuss lifecycles in engineering a system of systems. This is followed by a discussion of the human, organizational, and technological basis for integration of a system of systems or federation of systems. Structure, function, and purpose of systems of systems integration and architecture. Risk management in a system of systems. The bid and proposal process for system of systems integration and architecting. Complexity concerns, including evolutionary and adaptation issues in a system of systems. The lead systems integrator (LSI) and lead systems architecting concepts for a system of systems. Cost estimation and systems management in system of systems integration and architecting and reengineering in a system of systems.

The notion of Complex Engineered Systems of Systems (CESS) has emerged from initial efforts in the area of Complex Adaptive Systems (CAS). These systems are comprised of many heterogeneous systems and characterized by behaviors that emerge as a result of interactions among the systems at several levels of organization and abstraction. Understanding and designing a CESS is a major challenge for systems engineers today.

Service-oriented architectures (SOA) are one of the major resulting realities. SOA integrates talents and skills of an entire enterprise, with requisite and associated needs and computing know-how. In this course, we will present a service-oriented modeling framework that employs agile, universal, and integrated business and technology language to facilitate design, architecture and integration initiatives across systems of systems.

Prerequisite: Ideally, students will have SYST 520 and SYST 619, or permission of the instructor. Grading: Homework 30%; Exams (2) 50%; Term Paper 20%.

Texts and References: Access will be provided to a plethora of contemporary literature in system of systems and system family architecting and integration, much of it available on the Internet.

Course Call Numbers. SYST 659 – 003 – 77403

Fall 2012: Monday 4:30 – 7:10 pm, Room 1107 Volgenau School of Engineering

#### Course Schedule (preliminary and subject to change):

1. An Overview of Architecture Based Systems Engineering (27 August)
2. Architectural Frameworks and Architecture Development Processes (10 September)
3. Architectural Issues in Engineering a System of Systems or a System Family (17 September, 24 September)
4. Standards in Systems of Systems Integration and Architecting (1 October)
5. Service Oriented Architectures and Integration Issues (9 October, 15 October)
6. System Family Integration and Architecture Frameworks (22 October)
7. Evolutionary and Adaptation Issues in System Architecting and Integration (29 October, 5 November) (Mid Term Exams Due 29 October)
8. Cost Estimation and Case Studies in SOS and FOS (12, 19 November)
9. Architecture and Integration in Capability Based Planning of a SOS (26 November)
10. Complex Adaptive Systems Engineering in SOS and FOS (3, 10 December) Term papers due (10 December)
11. Final Exams Due on Blackboard (No Class) (17 December)

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