

## **SYS605: Systems Integration**

### **Overview**

Systems Integration introduces students to the principles and processes of integration, test, verification and validation within the systems engineering discipline. The course enables them to more effectively integrate and prove-in solutions that meet system requirements and customer needs. The course centers on a group project that students pursue in small teams. Systems Integration provides students with disciplined approaches for 1) performing early validation of a solution to meet a customer or stakeholder need, 2) factoring integration and test issues into the system requirements and architecture, 3) identifying and selecting among alternative means to integrate and test, 4) identifying comprehensive test cases, 5) performing fault diagnosis, 6) verifying systems, 7) validating systems, and 8) managing integration and test. The focus is on extending the model-based approaches for integration, verification and validation that are introduced in the courses on Fundamentals of Systems Engineering and Systems Architecture and Design. The course also emphasizes the importance of systems engineering the integration and test environment used to build and prove-in the system being developed. The intent is not just to describe the systems integration, testing, verification and validation process. Rather, the course helps students understand how to think through the choices at each step of the process. What decisions have to be made? What factors should be considered in making them? It is the answers to these questions that make for good systems integration, not just adherence to a standard process. The primary objective of this course is for the student to leave with a strong foundation in systems integration principles and processes.

### **Learning Goals**

After taking this course, the student will be able to:

- Understand the up-front need to factor in the integration, test, verification and validation of a system in determining the system requirements and architecture.
- Review and evaluate the various system integration, test, verification, and validation models in use today.
- Understand the criticality of defining, documenting and managing interfaces during system development.
- System engineer and architect the integration and test environment.
- Select suitable test methods, techniques, and metrics.
- Apply fault diagnosis techniques.
- Adopt a systems perspective when making integration and test decisions that affect the determination of performance, development time, or total ownership cost of the system.

### **Pedagogy**

The course will employ lectures, supplemental reading and additional resources, online discussion, individual assignments, weekly team assignments, an individual final examination, and a final team paper/presentation.

### **Required Text(s)**

None at this time.

## Required Readings

Required Readings will be assigned for each week and will be found on the course website.

## Course Outline

The course is divided into thirteen modules that are completed over the same number of weeks. Students are required to complete one team assignment and one individual assignment each week. Beginning in the second week, they also required to participate in an online discussion of the work of the previous week. There is no discussion following the assignment for the thirteenth week -- the task is to complete and post a final report/presentation on the team project -- a post mortem on a successful or unsuccessful systems integration effort. To promote full team member participation, students are required to assess their own contributions and other members of their team about midway in the semester and then again towards the end of the semester, prior to the grading of the final team project.

## Assignments

Specific details on the assignments are found on the course website. The assignments and their weights are as shown below:

1. Class Participation (discussions, assessments, profile)	26%
2. Individual Assignments	24%
3. Individual Final Examination	20%
4. Final Team project paper/presentation	30%
<b>TOTAL</b>	<b>100%</b>

Please note that assignments in this class may be submitted to [www.turnitin.com](http://www.turnitin.com), a web-based anti-plagiarism system, for an evaluation of their originality.

## Course Schedule

Week #	Topic
0	Orientation Week – Getting Started, Syllabus, Student Profile
1	Overview of the Systems Engineering & Integration Process
2	Pre-Requisites to Successful Systems Integration
3	Systems Integration Processes & Outcomes
4	Verifying the System
5	Validating the System
6	Defining, Documenting and Managing Interfaces
7	Impact of Commercial Off the Shelf Technology on Systems Integration
8	Integration & Test Architecture
9	Integration, Test and Repair Process and Tooling
10	Test Methods and Techniques
11	Fault Diagnosis
12	Integration & Test Management
13	Report Out on a Successful or Unsuccessful System Integration