

SYS650: System Architecture and Design

Overview

System Architecture and Design describes the fundamentals of system architectures and the architecting process, including practical heuristics for developing good architectures. The course picks up where Fundamentals of Systems Engineering (SYS 625) left off. In contrast to SYS 625, the focus of this course shifts inside the system boundary to develop a specification for a set of logical and physical elements that comprise the logical and physical architectures, defined to meet the system requirements reviewed during SRR. The course culminates with a Preliminary Design Review (PDR) in which the system design is reviewed before detailed design can begin. The course has a strong “how-to” orientation – both a team project and a final individual project is used to give students an opportunity to apply the architectural concepts and lessons learned. The course highlights linkages between early architectural decisions driven by customer requirements and concept of operations, and system operational and support costs.

Prerequisites

SYS625: Fundamentals of Systems Engineering
Cross-listed with CPE625 and SDOE625.

Learning Goals

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

- Understand the link between the functional and physical system architectures and the iterative nature of architecture development.
- Apply a process for flowing down or allocating system level requirements to components level requirements through equivalence, apportionment, synthesis and other methods.
- Apply the experience gained through the use of a systems engineering based tool that supports systems engineering requirements, architecture and modeling processes.
- Develop an architecture applying the methods learned in the course.

Pedagogy

The course will employ lectures, supplemental reading and additional resources, online discussion, individual and team assignments and a final team presentation and individual project.

Required Text(s)

In support of the Course Objectives, the textbook we will be using is either edition of:

- Buede, D. M., *The Engineering Design of Systems*, John Wiley, New York.
- 1st edition (2000) ISBNs: 0-471-28225-1 OR 978-0471282259, 488 pages.
- 2nd edition (2009) ISBNs: 0-470-16402-6 OR 978-0470164020, 536 pages.

This is also a good reference textbook for SYS625.

Textbook examples used in the lecture notes are further explained in the text. The textbook should provide reference material for both your individual and team assignments.

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 **or** one individual assignment each week. Individuals also participate in an online discussion each week. The online discussion requires an individual response to one Discussion Question (DQ) by Wednesday of each week followed by a follow-up response later in the week (by Sunday). 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. As the final team project, teams develop a Preliminary Design Review (PDR) presentation towards the end of the course. In Week 13, each student is required to submit an individual project to demonstrate personal mastery of the course material.

Assignments

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

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| 1. Class Participation (includes team assessments and profile) | 20% |
| 2. Individual Homework/Assignments | 20% |
| 3. Final Team project/presentation | 30% |
| 4. Final Individual assignment | 30% |
| TOTAL | 100% |

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

Course Schedule

Week #	Topic
1	SYS625/CORE Review, ATM CORE Guided Tour
2	Introduction to and Strategic Role of Architecture
3	Functional Architecture Design
4	Functional Architecture Tradeoffs
5	Tracing the Functional Architecture
6	Physical and Interface Architectures
7	Completing the System Model
8	Architecture Assessment and Design Factors
9	Qualification System and Test Procedures
10	Preliminary Design Review (PDR) Team Project
11	Functional Modeling and Updated ATM ORD
12	OO Methods and Architecture Frameworks
13	Wrap-Up and Final Assignment