Stevens Institute of Technology
WebCampus (elearn.stevens.edu)
Syllabus

Course SYS632: Designing Space Missions & Systems

Overview

This course examines the real-world application of the entire space systems engineering discipline. Taking a process-oriented approach, the course starts with basic mission objectives and examines the principles and practical methods for mission design and operations in depth. Interactive discussions focus on initial requirements definition, operations concept development, architecture tradeoffs, payload design, bus sizing, subsystem definition, system manufacturing, verification and operations. This is a hands-on course with a focus on robotic missions for science, military and commercial applications.

Learning Goals

This course will develop:
- Enhanced understanding of the big picture for space missions and systems
- Working technical knowledge of how all the elements of a space mission work and the key trades that lead to a successful mission
- Practical experience with using data and systems engineering processes in the Space Technology Series to develop conceptual designs for space missions and systems
- An organized framework for future space learning—on your own, in academic courses, or other short courses

Pedagogy

This course combines lectures, readings, real-life case studies, homework quizzes, and a design project to develop an understanding of the concepts, principles, performance metrics, and design of robotic space missions. A team project facilitates the integration and application of learned knowledge in a collaborative effort. Projects and case studies will be selected to coincide with participant interests and work related assignments.

Required Text

Space Mission Analysis & Design (SMAD)3rd Edition (Larson & Wertz, ed.)

Course Outline

The course is divided into thirteen modules that are completed over the same number of weeks. Students are required to complete one quiz as well as one online discussion each week. There is no quiz the first week. 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 graded assignments and their weights are as shown below:

1. Class Participation (discussions, assessments, profile)	13%
2. Weekly quizzes	12%
3. Mid-Term Exam	20%
3. Project	25%
4. Final Exam	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 #	Topics
1	Trends in Space, An Introduction to Space Systems Engineering
2	Conceptual Space Mission Design, Operations Concept Development
3	Space and Surface Environments, Understanding Orbits
4	Describing & Using Orbits, Space Mission Geometry
5	Maneuvering in Space, Trajectories for Moon/Mars
6	Orbit Design and Selection, Entry, Descent, Landing, Ascent
7	Payload Design,Spacecraft Bus Design and Sizing
8	Attitude Determination and Control, Guidance, Navigation & Control, Communications
9	Power Systems, Propulsion
10	Thermal Control, Structures, Command & Data Handling & Software
11	Reliability for Space Mission Planning, System Integration, System Verification & Validation
12	Mission Operations Analysis & Design
13	Launch Systems & Services, Estimating Space System Cost