San José State University
Aerospace Engineering
AE210 Advanced Space Systems Engineering, Fa11 2017

Instructor:	Dr. Periklis Papadopoulos
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Office Hours:	MW 4:30 pm – 5:30 pm
Class Days/Time:	Mon 18:00 pm – 20:30 pm
Classroom:	E164
Prerequisites:	BSAE or instructor consent

Course Description

The process of detailed design of bus and payload sub-systems of spacecraft will be studied in this course. The course will include topics on engineering design, design cycle and the phased approach in aerospace systems design. It will provide an overview of the engineering process used in aerospace mission and system design spanning the entire system life cycle for the near-Earth and outer space environment. Effects of gravity field, temperature and radiation on physical systems and the human physiology are some of the topics covered. Mission program inception, proposal development, and risk management will be studied.

Course Goals

Introduce students to:

- *Basic space systems engineering design practices*
- *Subsystem design and sizing*
- *System decomposition and integration principles*
- *Design optimization techniques*
- *Mission design principles and approach*
- *Understand PDR, CDR, FRR system requirements and design processes*
- *The analysis and optimization of multidisciplinary space systems during the conceive and design phases*

Course Learning Outcomes (CLO)

Upon completion of this course students will be able to:

1. *Decompose a complex space system to its sub-systems*
2. *Perform design of space exploration studies*
3. *Develop elements of an aerospace system proposal, develop specifications, project planning and mission scheduling*
4. *Assess the impact of the mission space environment on the system design and operations*
5. *Provide descriptions of the various elements comprising a space system.*
6. *Expose the student to the challenge of the integration of space system elements.*
7. *Provide an in-depth exposure to at least one of the spacecraft subsystem groups.*
8. *Develop and codify a prescriptive approach to multidisciplinary modeling and quantitative assessment of new or existing system/product architectures*

Required Texts/Readings

Textbook

Space Mission Analysis and Design, Wiley J. Larson, James R. Wertz

Other Readings

Instructor Notes

Understanding Space: An Introduction to Astronautics, Jerry Joe Sellers, William J. Astore, Robert B. Giffen, Wiley J. Larson.

Fundamentals of Space Systems by Vincent Pisacane and Robert Moore, Oxford Press

Midterm & Final Project

- *You must average at least 70% on your midterm and final project to receive an A or a B in the course.*

Grading Information

Workouts	*100 points*
Homework	*200 points*
Midterm Exam	*300 points*
Final Project	*400 points*

Total 1000 points
950 points < A+
900 points < A
850 points < A-
800 points < B+
750 points < B
700 points < B-
670 points < C+
650 points < C
600 points < D
Below 600 points = F

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/.

AE Department and SJSU policies are also posted at http://ae.sjsu.edu/program-policies.

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	8/30	Introduction, Course Overview, Space Mission Analysis and Design
2	9/6	Space Environments
3	9/13	Space Environments / Systems Engineering Process
4	9/20	Mission Objectives, Design, Subsystems / Final Project Proposal Due
5	9/27	Design, Subsystems, System-level coupling and interactions
6	10/4	Design, Subsystems, System-level coupling and interactions
7	10/11	Systems Engineering Process, Mission Objectives, Design, Subsystems, System-Level Coupling and Interactions
8	10/18	Proposal Development for System and Subsystem Model Development: System Decomposition, Interface Control Documentation
9	10/25	Space System Design Optimization and Exploration Techniques / 1st Interim Project Report Due / 1st Progress Presentations
10	11/1	Design Sensitivity Analysis, Trade-Off Studies and Approximations and Multi-Objective System Level Optimization, Spacecraft Design and Sizing
11	11/8	Launch Vehicles and Spacecraft Architectures and Subsystem Presentations • Communications, Command and Data Handling • Power
12	11/15	Launch Vehicles and Spacecraft Architectures and Subsystem Presentations • Thermal / 2nd Interim Project Report Due / 2nd Progress Presentations
13	11/22	Launch Vehicles and Spacecraft Architectures and Subsystem Presentations • Propulsion / 2nd Progress Presentations
14	11/29	Launch Vehicles and Spacecraft Architectures and Subsystem Presentations • Attitude Dynamics and Control • Structures
15	12/6	Launch Vehicles and Spacecraft Architectures and Subsystem Presentations • Guidance, Navigation, and Control • Mission Operations, Spacecraft Integration
16	12/13	Miscellaneous Topics, Summary, Review / Final project presentations
Final Exam	Thursday, December 20	ENGR 164 at 6:00 pm – 8:45 pm / Final Project Presentations / Final Project Report Due