Stevens Institute of Technology
WebCampus
Course Syllabus

Course SYS635: Human Spaceflight

Overview

This course is designed to provide the conceptual framework for developing crewed space missions starting from a blank sheet of paper. It describes the crewed space mission design and analysis process. It begins with the fundamentals of the operating environment for near-Earth orbits, the Moon, and Mars. After the course, the student will be able to describe how humans will challenge the unknowns around the Moon and Mars and take on the tremendous tasks of accomplishing those missions.

Learning Goals

- The student will learn about human physiology, behavior, and design factors in those environments, and analyzes the orbits and trajectories required to perform crewed missions.
- The student will develop an understanding for practical, detailed concepts and tools to analyze and design both the space and planetary segments required to support crewed missions, including architecture and configuration, life support, vehicle subsystems, entry, landing, and ascent vehicles, habitats, surface vehicles, and in-situ resources.
- The student will also understand space propulsion systems and the process to select the launch systems required to place space assets into the proper orbit or landing destination.
- Students will learn about the mission operations segment to include operations in space, Earth-based operations, and command, control and communication.

Pedagogy

This course combines lectures, readings, case studies, quizzes, and graded homework to develop an understanding of the concepts, principles, performance metrics, and design of crewed space missions.

Texts

Required: Human Space Mission Analysis and Design, 2nd edition [Larson and Pranke, CEI]
Available as an Inkling eBook from **CEI** at:

https://spacetechnologyseries.com/~spacet9/books/Human-Spaceflight.html

Recommended: Understanding Space: An Introduction to Astronautics, 4th edition [Sellers, et al. CEI]
Available as an Inkling eBook from **CEI** at:

https://spacetechnologyseries.com/~spacet9/books/Understanding-Space.html

Course Outline

The course is divided into thirteen modules that are completed over the same number of weeks. Graded homework, case studies, quizzes and exams are distributed throughout the course to reinforce learning, encourage participation and ensure you stay caught up on the material.

Assignments

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

Personal Study Plan, Profile, Annotated Syllabus	4%
Class Participation (2 x Case Studies)	10%
Quizzes (4 @ 2% each)	8%
Homework Problems	25%
Mid-Term Exam	20%
Mid-Term Study Plan Review	1%
Final Study Plan Review and Self-Assessment	2%
Course Feedback (PLEASE!)	0%
Final Exam	30%

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.

See next page for **Course Schedule**

Week	Topics	Handout Reading up to Page	Text Reference Chapters	Graded Event
	Orientation Week			
0	Course Intro			
	Module 1: Mission Design			
1	Designing Human Space Missions	16	1, 2, 8	Personal Study Plan and Profile, Case Study 1 (variable due dates)
2	Safety of Human Space Missions, Space Environments	52	3, 4, 8	Homework (HW) 1
	Module 2: Crew			
3	Physiology of Human Spaceflight	64	5	Homework 2
4	Human Factors and Psychology, International Crewed Missions	80	6, 7, 30	HW 3, Quiz 1
	Module 3: Orbits & Trajectories			
5	Understanding Orbits, Describing and Using Orbits, Maneuvering and Rendezvous	110	9	Homework 4
6	Entry, Descent, Landing and Ascent	129	10	Homework 5
	Module 4: The Space Element			
7	Designing and Sizing Space Elements, Designing and Sizing Transfer Vehicles, Cost Estimating	150	11, 12, 29	Homework 6, Quiz 2
8	Review for Mid-term Exam, Finish Case Study 1 Reviews			Mid-term Exam, Mid-term Study Plan Review, Case Study 1 Reviews
	Module 5: Support Subsystems			
9	Thermal Control, Environmental Control and Life Support, Crew Accommodations	189	16, 17, 18	Case Study 2 (variable due dates)
10	ADCS/GNC, Electrical Power, Data Handling	222	19, 20, 26.6, 26.10	Homework 8
11	Structures, Space Propulsion	239	21, 24	Homework 9, Quiz 3
	Module 6: Mission Operations Element			
12	EVA Systems, Mission Operations, Command, Control and Communications (C^3)	270	22, 26, 27	Homework 7
13	Logistics Support, In-Situ Resources	286	28, 15	Homework 10, 11
14	ISS, Soyuz & Commercial Crew Case Studies, Review	Case Studies Section		HW 12, Quiz 4, Final Plan Review & Self-Assessment, Case Study 2 Reviews due
	Final Exam Period	Review All		Final Exam