SYS/SDOE 635

HUMAN SPACEFLIGHT

School of Systems&Enterprises

THIS MODULAR COURSE CAN BE TAKEN FOR GRADUATE CREDIT TOWARDS A MASTER'S IN SYSTEMS ENGINEERING OR AS PART OF A PROFESSIONAL DEVELOPMENT PROGRAM.

MODULE DESCRIPTION AND OBJECTIVES

This module examines the real-world application of of space systems engineering principles to the challenge of human spaceflight. Taking a practical, process-oriented approach, the course provides the conceptual framework for developing space missions of manned spacecraft starting from a blank sheet of paper. It describes and teaches the manned space mission design and analysis process. The course is aimed at equipping each participant with the fundamental tools to complete a conceptual design and critically analyze the impacts of evolving requirements.

MODULE ORGANIZATION

This modular course combines lectures, readings, case studies, and in-class exercises to develop an understanding of the systems integration concepts. Lastly, the team project on a failed or successful system integration project allows participants to apply and integrate their knowledge in a team environment.

MODULE AUDIENCE

This module addresses the design of human space missions and systems systems from the perspective of designers, integrators, acquirers and users of these complex systems.
It is intended for design engineers, systems engineers, payload principle investigators, subsystem engineers or project managers who are responsible for the detailed design and operation of space systems.

COURSEWARE

Each participant will receive: A copy of the course text Human Spaceflight: Mission Analysis & Design edited by Wiley J. Larson and Linda K. Pranke. A complete set of course notes with copies of all slides used in the presentations.

MODULE DIRECTOR

Dr. Jerry Sellers
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MODULE REGISTRATION & INFORMATION

To inquire about registering for this modular course, please contact Stevens SDOE Program Manager, at SDOE@stevens.edu.
Enrollment forms can be completed online via
www.stevens.edu/SDOEenroll

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For more information, visit our website at:
www.stevens.edu/sse

STEVENS Institute of Technology

DAY 1	
SESSION 1	**Course Overview;** Introduction to Human Spaceflight
SESSION 2	**Operational Environments** – Design and operational challenged posed by the in-orbit environments and the surface environments of the Moon and Mars
DAY 2	
SESSION 3	**Humans in Space** – Physiology, Psychology
SESSION 4	**Orbits and Trajectories** – Basic Orbital Mechanics, Orbit Maneuvers, Rendezvous, Lunar and Interplanetary Trajectories
DAY 3	
SESSION 5	**The Design and Sizing of Space Habitat** – Fundamentals of human habitat design, requirements and principles
SESSION 6	**The Space Element** – Crewed spacecraft design and sizing
DAY 4	
SESSION 7	**The Surface Element** – Design of surface habitats, surface mobility and robotic systems
SESSION 8	**Subsystems** – Communication Subsystems, Electrical Power Subsystem, Rocket Propulsion, Thermal Control Subsystem, Structures & Mechanisms, Command & Data Handling Subsystem, Mission Software, System Reliability, Integration, Verification & Validation, Entry, Landing and Ascent Vehicles, Robotic Surface Vehicles
DAY 5	
SESSION 9	**Space Transportation** – Overview of launch vehicles and launch services
SESSION 10	**Mission Operations, Course Evaluation and Wrap-up** – Mission Operations Functions, Launch & Early Orbit Operations, Operations Complexity. Estimating Space System Costs, Group project presentations