

# Syllabus

## Introduction to Human Space Flight

This course introduces students to the challenges and rewards of human space flight. Historical and current space programs and spacecraft will be discussed, along with the motivation, cost and rationale for human space exploration. An overview of the space environment will be presented in the context of what is needed to sustain human life and health, including physiological and psychological concerns, in a space habitat. Current events including space research will also be highlighted. Students will learn about the astronaut selection and training processes. Finally, anomalies, mission operations and future program directions, with some insight into career planning, will be covered. The emphasis on learning will be to understand the way humans approach the exploration of space and how such a bold endeavor affects us individually and as humans. Students will be encouraged to explore through readings and research different perspectives of spaceflight to include political, scientific, historical, economic, cultural, and social as well as to consider the impact on our future.

**Instructor:** Jim Voss, Former Astronaut, Scholar in Residence,

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Office: Aerospace Building

**Prerequisites:** None, open to all majors at any level

**Space Minor:** This class is one of the elective courses for the CU Space Minor that is open to any undergraduate student from any major.

For more information on the CU Space Minor  
see: <http://www.colorado.edu/spaceminor/learn-more>

**Textbook:** Harrison, A., *Spacefaring - The Human Dimension*, University of California Press, Los Angeles, CA, 2001

**Grading Breakdown:** Homework (20%), Quizzes (30%), Project (15%), Exam 1 (15%), Exam 2 (20%)

**Assignment Completion Policy:** All assignments must be completed satisfactorily to pass this course.

## Required Readings:

- Harrison, A., *"Spacefaring - The Human Dimension"*, University of California Press, Los Angeles, CA, 2001
- Various articles and NASA reports provided on the course home page

## Suggested Readings:

- O'Neill, G. K., *The High Frontier - Human Colonies in Space*, Space Studies Institute Press, Princeton, NJ, 1989
- Hurt, H., *For All Mankind*, The Atlantic Monthly Press, New York, NY, 1988
- Kranz, G. *Failure Is Not an Option*, Simon and Schuster, New York, NY, 2000
- Burrough, B., *Dragonfly – NASA and the Crisis Aboard Mir*, Harper Collins, New York, NY, 1998
- Jones, T., *Sky Walking – An Astronaut's Memoir*, Harper Collins, New York, NY, 2006
- Mullane, M., *Riding Rockets – The Outrageous Tales of a Space Shuttle Astronaut*, Scribner, New York, NY, 2006
- Any science fiction by H.G. Wells, Jules Verne, Isaac Asimov, Robert Heinlein, Arthur C. Clark

## Essay / Project / Case Study:

Students will research and write about topics associated with human spaceflight and the social, political, and technical implications. Essays or case study format is used to explore complex human spaceflight issues to extend the students knowledge and allow detailed contextual analysis of specific topics or events. Students will be asked to write about current topics associated with human spaceflight. Examples are:

- Future human space exploration
- Political and budget implications on human spaceflight
- Human spacecraft and spacecraft systems
- US space accidents

A project assignment is used to have students develop a plan for an exploration spacecraft using all information learned in the semester about human spacecraft systems. Result of the project will be a written report or a verbal presentation.

## Class and Pertinent CU Policy - Please read this.

Link: [Class Policy Information](#)

## Lecture Topics:

Introduction and Course Overview. Why Space?

History of Human Spaceflight

Spacecraft Overview  
Space Environment  
Life Support Requirements  
Physiological Effects and Countermeasures  
Operational Space Medicine  
Spaceflight Analogs and Human Factors  
Life Support Systems  
Habitability and Crew Accommodations  
Astronaut Selection and Training  
Psychology of Spaceflight - Group Dynamics, Stress, and Coping  
Space Accidents and Anomalies  
Working in Space  
Robotics  
Extra Vehicular Activity - Physiology and Space Suit Design  
Special Topic – Guest Lecture  
Mission Operations and Planning  
Surface Elements  
Space Research  
Space Tourism  
Next Human Spacecraft Systems  
Space Future – Settlements, Migration  
Space Career Planning  
Space Policy and Funding

**ASEN 3036 Detailed Lecture Topics:**

Introduction and Why space? (1 hour)

Administration for the class, background information

Philosophical perspective

Reasons for going to space

NASA and our national space policy

History of human spaceflight and U.S. Exploration plans(1 hour)

US Space Program goals and plans

History of human spaceflight

People

Programs

Spacecraft

Space environment (1 hour)

Hazards

Space operational medicine

Countermeasures

Physiological effects of spaceflight (1 hour)

Human response

Long term health

Biomedical aspects

Psychological and sociological aspects of human spaceflight (3 hours)

Crew interactions and international crew aspects

Habitability

Group dynamics

Stress and coping

Life support systems (2-3 hours)

Environmental control and life support systems

Spacecraft systems examples

Human factors for spaceflight (1 hour)

Current and recent spacecraft overview and space flight analogs (3 hours)

Space Shuttle

International Space Station

Russian Soyuz

Commercial spacecraft

Analogs for space and interplanetary destinations

Living in space (2 hours)

Hygiene

Recreation

General performance factors

Living and working on the ISS

Space Programs (1 hour)

NASA

International programs

Programmatic structure

Historical perspectives

Philosophical considerations

Astronaut selection and training (1-2 hours)

Selection process and advice

Astronaut Candidate training

Crew training

Extra Vehicular Activity (2 hours)

Physiology of space walking

Space suit design

Robotics (1 hour)

Human interface

Autonomous vs. controlled

Surface Elements (1 hour)

Human habitats

Surface vehicles

Space mission accidents and anomalies (1 hours)

- Spaceflight case studies

- Apollo 1

- Challenger

- Columbia

- Russian mishaps

- Technical aspects

- Ethical and moral aspects

- Management decision making

Space Mission Operations and Planning (1 hour)

Space research (as required)

- Humans as subjects

- Current topics

Space current events and projects (as required)

Space tourism (1 hour)

- Past and current activities

- Future

Future of Spaceflight (1 hour)

- US future programs

- Moon and Mars

- Space settlements – when, where, how

- Interstellar migration challenges

Space Policy and Funding (1 hour)

- Funding

- Public opinion

- Politics

Career planning insight (1 hour)

- Bioastronautics classes and study opportunities

Engineering challenges

Biomedical challenges

Career opportunities

Guest Lectures (0-2 hours)

Invited lecturers from NASA, aerospace companies, former astronauts

Examples: Chief Scientist USAF Space Command, NASA  
Managers; Astronauts, Under Secretary of the AF for Space

Lectures on special topics of current interest