

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.

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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%)

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 student's 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

- Analogues 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

