Syllabus

ASEN 3036 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


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

Required Readings:

- Various articles and NASA reports provided on the course home page
Suggested Readings:

- 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, project report, 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.

**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
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 (Examples: International Space Station Operations, Cold War Space Race, Space Research)
Mission Operations and Planning
Surface Elements
Space Tourism
Next Human Spacecraft Systems
Space Future – Settlements, Migration
Space Career Planning
Space Policy and Funding
Astronaut Training
Astronaut Selection

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