

## **ASEN 6519: Special Topics – Extravehicular Activity**

Allison Anderson

AERO N303

303 492 8511

[apanders@colorado.edu](mailto:apanders@colorado.edu)

Lecture: T/Th 10:05 – 11:20 pm

Office Hours: W 4:00 – 5:00 pm

### **1. Overview**

Extravehicular activity (EVA) is critical for human spaceflight to achieve tasks such as habitat construction, hardware repair, and planetary exploration. These activities are complex, requiring substantial preparation to be executed safely and successfully. EVA has enabled us to accomplish some of the greatest feats of the space program, such as the Apollo moonwalks and Hubble Space Telescope repair missions. Despite its many advantages, these activities are not without cost to the astronauts who perform EVA. Much of the technology used to perform EVA is based on heritage designs and proven technology, enabling an exceptionally high safety record despite the potential risks associated with EVA. As we transition back to EVA on the surface of celestial bodies, such as the Moon or Mars, advancements in EVA hardware and new paradigms in operations will be required.

This course is designed to expose students to all aspects of EVA (see 3. Topics Covered). Although not a traditional academic topic, this course will draw upon the academic elements of design, engineering, technology development, physiology, operations, human-machine interaction, and geology to provide an interdisciplinary look at this topic. The primary learning objectives are:

- Develop a historical perspective on EVA to enable an understanding of current capabilities and technologies.
- Distinguish between the requirements, needs, and challenges for performing EVA in all anticipated environment regimes.
- Investigate solutions to address current needs in EVA.

This course will only be offered in virtual formats (synchronously or asynchronously) this semester. I strongly encourage you to make the scheduled class time rather than watching the filmed lectures online. This class is most fruitful with active discussions, often resulting from questions asked by students. Despite the virtual format, I will strive to maintain an interactive atmosphere as much as possible.

### **2. Assessment**

Table 1 outlines the material by which student performance will be assessed. This course will have 2 exams and we will not use the time-slot assigned during finals week, unless needed for schedule accommodations (see below). Students will engage in a team-based design project. Distribution of the project assessment is shown in Table 2. Additional details on timeline and due dates can be found in the course schedule document.

*Table 1: Distribution of course assessments*

Exams (2)	30%
Homework (4)	30%
Design Project	30%
In-Class EVA Presentation	10%
	<b>100%</b>

*Table 2: Distribution of project assessment*

Project proposal	5%
Mid-semester project review	5%
Final project deliverables	15%
Peer review	5%
	<b>30%</b>

To provide flexibility and accommodate those who may become ill this semester, I am pre-emptively establishing the following guidelines:

- If you are ill, please let me know as soon as possible so I can be aware of your situation and any additional issues that may arise as a result. Early, frequent communication is preferred.
- Attending class synchronously is not required, but it is strongly encouraged.
- If you must reschedule your EVA presentation due to illness, please email me to find a solution.
- In general, no late homework is accepted in this class. However, the submission window for each homework will be open for an additional 2-weeks after the due date. You are permitted **one** late assignment with up to a 2-week extension during which you can turn in your work. You are *strongly* encouraged to only use the extended submission period in the event you become ill. No homework after the 2-week submission window will be accepted.
- In general, all exams must be completed during the time scheduled, and I will not give make-up exams. However, any student who must miss an exam can take a make-up exam during our allotted test period in Finals week (Monday May 3, 4:30 pm). You may *only* take the make-up exam if you missed one of the previously scheduled exams.

### **3. Topics Covered**

The following topics will be addressed, both in lecture and through relevant readings: pressure garments, life support systems, health concerns, planetary geology, exploration, training analogs, tool design, transportation systems, and operations. Additional details can be found in the course schedule document.

### **4. Textbook**

The required textbook for the class is Thomas and McMann. U.S. Spacesuits, 2nd ed. ISBN 978-1-4419-9566-7. It is important to get the 2nd edition since it is substantially updated from the original version of the text. Additional readings will be assigned from other resources, but I will provide PDFs since some sources are out of print or from a larger text not required for purchase.

For additional reading that may be of interest, but not required, please see:

- Peter Eckart, Spaceflight Life Support and Biospherics. Springer, 1996. (Available through the CU E-library)
- Nicholas de Monchaux, Spacesuit: Fashioning Apollo. MIT Press, 2011.
- Thomas J. Kelly, Moon Lander. Smithsonian Books, 2001.
- Dave Mindell, Digital Apollo. MIT Press, 2008

## **5. Classroom Behavior**

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

## **6. Requirements for COVID-19**

There will be no in-person elements associated with this class. As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. For more information, see the policies on [COVID-19 Health and Safety](#) and [classroom behavior](#) and the [Student Code of Conduct](#). If you require accommodation because a disability prevents you from fulfilling these safety measures, please see the “Accommodation for Disabilities” statement on this syllabus.

All students who are new to campus must complete the [COVID-19 Student Health and Expectations Course](#). Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home. In this class, if you are sick or quarantined, please let me know. The aforementioned accommodations should enable you to successfully complete all course deliverables, but I appreciate you communicating your situation early with me.

## **7. Accommodation for Disabilities**

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or [dsinfo@colorado.edu](mailto:dsinfo@colorado.edu) for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

## **8. Preferred Student Names and Pronouns**

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

## **9. Honor Code**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code ([honor@colorado.edu](mailto:honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the [Honor Code Office website](#).

## **10. Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation**

The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or [cureport@colorado.edu](mailto:cureport@colorado.edu). Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

## **11. Religious Holidays**

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please let me know as soon as possible if you have a conflict. The aforementioned COVID-19 accommodations for assessment should enable you to successfully complete all class elements, but please let me know at a minimum of 2 weeks in advance.

See the [campus policy regarding religious observances](#) for full details.