

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

Allison Anderson

ECAE 115

303 492 8511

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

Lecture: T/Th 9:30 – 10:45 am, Fleming 157

Office Hours: T 11:00 am – 12:00 pm, Th 4:30 – 5:30 pm, ECAE 115

### **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.
- Create solutions to address current needs in EVA.

### **2. Assessment**

Table 1 outlines the material by which student performance will be assessed. The primary evaluation component of the course will be a team-based design project. Distribution of the project assessment is shown in Table 2. This course will have 2 exams, but we will not use the time-slot assigned during finals week. Additional details on timeline and due dates can be found in the course schedule document.

*Table 1: Distribution of course assessments*

Exams (2)	25%
Homework (4)	30%
Design Project	40%
In-Class EVA Presentation	5%
	<b>100%</b>

*Table 2: Distribution of project assessment*

Project proposal	5%
Mid-semester project review	10%
Final project presentation	10%
Peer review	5%
Project report and hardware deliverable	10%
	<b>40%</b>

### **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 and exploration, training analogs, tool design, exploration teams, 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 as needed, and will be announced at least one week in advance of the due date.

For additional reading, 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. 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 \(www.colorado.edu/disabilityservices/students\)](http://www.colorado.edu/disabilityservices/students). 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 or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website and discuss your needs with me.

### **6. 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, if you need accommodations for an observance, please let me know at least 2 weeks prior to

the date and I will work with you to come up with a reasonable solution. See the [campus policy regarding religious observances](#) for full details.

## **7. Classroom Behavior**

Students and faculty each have responsibility for maintaining an appropriate learning environment. 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. Class rosters are provided to me with your legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

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

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the [OIEC website](#).

## **9. Honor Code**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to [the academic integrity policy](#). Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council ([honor@colorado.edu](mailto:honor@colorado.edu); 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the [Honor Code Office website](#).