

# Syllabus

## ASEN 4128 Human Factors in Engineering and Design

### **Human Factors in Engineering and Design Course Description:**

In this course we investigate the relationship between human operators and the complex systems they interact with.

Our focus will be: how do we account for human's cognitive and physical limitations when designing a complex system.

We will start with learning some of the basic limitations that we as human possess, as we do this we will review the large variety of accidents that can be attributed to human limitations. The focus is primarily on aviation design and aviation accidents as this field of study highlights the truly tragic ramifications of poor design. That said, the principles addressed in this course are relevant to all CU engineering disciplines.

Students will begin with lectures pertaining to the many HF disciplines and issues involved in designing with human limitations considered. HF issues will be highlighted by reviewing aircraft accidents and focusing on the latent conditions that existed in the design long before the aircraft ever flew.

Students will be able to conduct some basic labs where they conduct task analyses, complete ergonomic, usability and workplace assessments and work towards a group project of designing and assessing a cockpit for a specific aircraft role.

The field of human factors is growing rapidly, across multiple industry sectors. This course will introduce students to the field and may lead to a future as a multi-disciplined engineer, a skill-set that employers find very appealing.

**Instructor:** Hank Scott, Adjunct Instructor

Email: [hank.scott@colorado.edu](mailto:hank.scott@colorado.edu)

**Prerequisites:** Open to all Engineering majors.

**Textbooks:**

1. Human Factors in Engineering and Design, 7<sup>th</sup> Edition, Sanders and McCormick( 1993) McGraw-Hill

*By R.G. Grant DK Publishing (2007).*

**Grading Breakdown:**

Mid-term Exam 20%

Final Exam 20%

Workload Assessment (completed in a small group of 3 – 4 students) 30%

**Required Readings:**

**Publications:**

- Human Factors in Engineering and Design, 7<sup>th</sup> Edition, Sanders and McCormick (1993) McGraw-Hill

**Other Sources:**

- Excerpts from Mil-standards:
  - 1472F Human Engineering,
  - 1333 Aircrew Station Geometry,
  - 1787C Aircraft Display Symbolology, Interface Standard
  - 850B Aircrew Station Vision
  - UK MOD-STD 00-25 (UK Military HF Standards).

**Course Schedule:**

**Introduction**

SHELL/Reason Model/Human Subjects in Research

**Module 1 - The Senses**

Sight/Depth Perception/Optic Flow

Touch/Smell/Proprioceptors/Vestibular/Hearing

**Module 2 - Information Processing**

Information Processing/Signal Detection/Perception

Attention/Distraction/Vigilance

Memory/Selection and Decision Making/Human Error

**Module 3 - Human Performance Limitations and Work Environment**

Heat/Noise/Vibration/Altitude/G Loading/Illumination

Affordability/Compatibility

Workload Measurement

**Module 4 - Ergonomics**

Controls and Displays/Cockpit Assessment

Reach Zones/Measures/Population

**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](#).

## Requirements for COVID-19

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. Required safety measures at CU Boulder relevant to the classroom setting include:

- maintain 6-foot distancing when possible,
- wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,
- clean local work area,
- practice hand hygiene,
- follow public health orders, and
- if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert [CU Boulder Medical Services](#).

Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to [Student Conduct and Conflict Resolution](#). 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.

Before returning to campus, all students must complete the [COVID-19 Student Health and Expectations Course](#). Before coming on to campus each day, all students are required to complete a [Daily Health Form](#).

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 and complete the [Health Questionnaire and Illness Reporting Form](#) remotely. In this class, if you are sick or quarantined please advise me via email so remote learning options and alternate assessment can be arranged.

### 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.

### 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.

### **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](#).

### **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 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.

### **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, simply advise me by email of any conflicts or issues and we will work to provide alternate accommodations.