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ASEN 6050 S a I a

Instructor: Prof. Zoltan Sternovsky, (303) 819-2783, Zoltan.Sternovsky@colorado.edu

Lecture Time: Tuesday/Thursday 8:30 – 9:45 am (meets remotely via zoom)

Zoom link: TBD

Office Hour: TBD

Webpage: <https://canvas.colorado.edu/>, & shared google drive

Text Books - none required, reading material will be posted as needed. See class web portal.

Overview

Developing scientific instruments for space applications requires a team of scientists and engineers working closely together, starting from identifying an outstanding science question, then deriving the measurement requirements, and finally designing and building a unique piece of hardware that will collect the data needed to answer the original science question. One of the challenges in the design process is evaluating the effects of the space environment on the operation and longevity of the instrument. In addition, there is a complex frame of constraints on the hardware, including the cost, mass, and power and data rate limitations, as well as the constraints posed by the mission design and operations. This class is an introductory overview of space instrumentation from the point of view of an 'instrument scientist', who will link the science goals to measurement requirements, select the method of measurement, and define the key characteristic of the of the instrument. There are three common elements to building space instruments: (1) understanding the space encolor 9.2s6(18.8 .6 (i) 4.6 0 0 46 5.3 (r) #cm BT.1 (o) [ET710 Tm /TT9.2s) -6.5 .1 6.5 pa

Meteoroid environment

Review of relevant physical processes: secondary electron emission (SEE), ion-surface interactions, photoemission, ionization, particle and photon scattering.

Materials for space instruments: CTE, outgassing, mass loss, radiation damage, various properties and limitations

Detectors:

Photon detectors

Particle detectors

Electronics: Basics of front-end electronics

Space Instruments*

Dust detectors and analyzers

Magnetometers

UV spectrometers

IR instruments (thermal imaging, spectrometers)

Imaging/cameras

Neutral/ion mass spectrometers

Plasma instruments (Faraday cups, solar wind analyzers, energetic particle detectors)

Neutral particles (high and low energy)

*For each instrument type, we will review the relevant science questions it can answer, the physical principle of the measurement, the basic parameters used to describe performance, and review the design of past instruments and those currently in development.

Prerequisites

ASEN 5335 Space Environment.

Class Format and Assessment/Exams

Lectures per assigned schedule. There will be weekly or biweekly homework assignments. The final grade will be based on the submitted homework (40%), a mid-term project (20%), and the final

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 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 your professor.

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, you must let the instructors know of any such conflicts within the first two weeks of the semester so that we can work with you to make reasonable arrangements. See the [campus policy regarding religious observances](#) for full details.

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

- wear a cloth face covering (over nose and mouth), especially when unable to maintain a distance of at least 12 feet,
- 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
 - you live on-campus, please alert [CU Boulder Medical Services](https://www.colorado.edu/healthcenter/coronavirus-updates/symptoms-and-what-do-if-) (<https://www.colorado.edu/healthcenter/coronavirus-updates/symptoms-and-what-do-if->