

ASEN 6519 Aerospace Environments – Upper Atmospheres

Syllabus, Spring 2020

Lecture: AERO 114 T, Th 1:00-2:15 pm

Web page: Canvas course page

Instructor

Prof. Jeff Thayer

Office: N407/23.5ne7.7 (nvut.5)IT15-12.0 4eyyplasma physical, dynamical, chemical,

dynamic processes that determine the evolving states of the upper atmospheres and ionospheres of Earth and Mars. The overall context is the solar-terrestrial system, wherein energy from the Sun (i.e., visible, UV and EUV radiation and the solar wind and interplanetary magnetic field) is transformed into various forms that facilitate flow into, and out of, the upper atmospheres. In part, specific topics to be covered will be determined by student needs and interests. The CU Space Weather Technology, Research and Education Center (SWE-C) will also provide resources to students in computational labs that expose students to the latest modeling and data developments.

Class Learning Goals

The goals of this course are to expose students to the multidisciplinary field of upper atmosphere research and develop graduate students' research capabilities. Students will improve their analysis skills working with current upper atmosphere data sets, their research acuity by conceptualizing and understanding issues currently under study by the upper atmosphere community, their presentations skills by concisely and coherently presenting their analyses in a research conference format. Students will actively participate in the teaching-learning process through in-depth review of articles in the archival literature, and oral presentations of their analyses in class.

Prerequisites

Level of knowledge of the solar-terrestrial system similar to that of AS 5335 Aerospace Environments

Course Content

The course is divided into three parts: (1) Physical Processes, (2) Data Analysis, and (3) Presentations. The course is designed to be completed in 15 weeks, with 1.5 units of credit.

- f* Energy sources and sinks
 - f* Exospheric temperature
 - f* Temperature profile
 - o Collisions
 - f* Binary elastic collisions
 - f* Maxwell molecule collisions
 - f* Momentum transfer collision frequencies
 - o Dynamics
 - f* Internal and External Forces
 - f* Wind systems
- x Upper Atmosphere: Ionosphere (3weeks)
 - o Formation
 - f* Ionization
 - f* Chemistry
 - f* Layering
 - o Thermal structure
 - f* Ion energy sources and

- x The Upper Atmosphere and Solar Terrestrial Relations, J.K. Hargreaves, Van Nostrand Reinhold Company.
- x Physics of the Space Environment, Tamas Gombosi, Cambridge University Press.

Web resource material can be found at:

- x NRL MSIS, <https://www.nrl.navy.mil/ssd/branches/7630/modeling/peratmosphere>
- x NASA IRI, <http://iri.gsfc.nasa.gov/>
- x NCAR TIEGCM, <http://www.hao.ucar.edu/modeling/tgcm/>
- x NASA CCMC, <http://ccmc.gsfc.nasa.gov/>
- x SPENVIS, <http://www.spennis.oma.be/announcement.php>
- x OMNIWEB, <http://omniweb.gsfc.nasa.gov/>

Class Format

The course will involve weekly lectures on topical material outlined above in the course content. These lectures will be provided by the instructors and invited speakers. Homework and ~~term~~ take home exam will be issued. A student project will be required. The class will conclude with final oral and written reports of each student's ~~project~~ presentations will involve research, analysis, and demonstrated understanding of ~~study~~ ~~work~~. It will be evaluated by their peers and instructors. Students will participate in both the oral presentations and written reports by providing peer reviews of the work presented.

Honor Code (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 Code Office website](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, intimate partner abuse (including 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. Information about the OIEC, university policies, [anonymous reporting](#) and the campus resources can be found [at the OIEC website](#). Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, so 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