

# SPACE WEATHER AND APPLICATIONS - GRADUATE CERTIFICATE

This certificate provides students with interdisciplinary skills in the field of space weather of both fundamental processes in science and practical applications to space-based and ground-based technology.

This certificate is available to degree-seeking and non-matriculated students. Additional certificate information can be found on the department's Space Weather and Applications Certificate (<https://www.colorado.edu/aerospace/current-students/graduates/curriculum/certificate-programs/space-weather-and-applications/>) webpage.

## Distance Education Option

Students can take individual courses toward a master's degree or graduate certificate through distance education (online). For more information, connect with the individual graduate program directly.

## Requirements

### Admission Requirements

- Completed undergraduate degree from an institution accredited by an agency recognized by the U.S. Department of Education or its equivalent.
- Undergraduate courses in calculus, linear algebra and differential equations; two semesters of undergraduate calculus-based physics; and at least two semesters of upper-division undergraduate courses in engineering or physics.
- Ability to program at a level that will enable successful completion of graduate course assignments.

For more information, degree-seeking students may visit the AES Certificates (<https://www.colorado.edu/aerospace/academics/graduates/curriculum/certificates/>) webpage; nondegree-seeking and non-matriculated students may visit the AES Certificates & Continuing Education (<https://www.colorado.edu/aerospace/admissions/graduates/degree-programs/certificates-continuing-education/>) webpage.

### Required Courses and Credits

Students are required to complete 12 credit hours total for this certificate, including ASEN 5335, two courses from the Tier 1 electives list and one additional 3-credit course from the Tier 2 electives list. At least one course must be outside of the student's home department.

Grades of B or higher are required for fulfillment of requirements and certificate award. Students also pursuing other graduate certificates may *not* use the same courses to count for both certificates.

Code	Title	Credit Hours
<b>Required Course</b>		
ASEN 5335	Aerospace Environment	3
<b>Tier 1 Foundational Electives</b> <sup>1,2</sup>		
Choose two:		6
ASEN 6050	Space Instrumentation	
ASEN 6365	Lidar Remote Sensing	
ASTR 5140	Astrophysical and Space Plasmas	

ASTR 5150	Introductory Plasma Physics
ASTR 5300	Introduction to Magnetospheres
ATOC 5050	Atmospheric Thermodynamics and Dynamics
ATOC/ASEN 5235	Introduction to Atmospheric Radiative Transfer and Remote Sensing
<b>Tier 2 Concentration/Focus Electives</b> <sup>2</sup>	
Choose one:	
3	
<i>Applications</i>	
ASEN 5016	Space Life Sciences
ASEN 5090	Introduction to Global Navigation Satellite Systems
ASEN 6265	Fundamentals of Spectroscopy for Optical Remote Sensing
<i>Design &amp; Instrumentation</i>	
ASEN 5158	Space Habitat Design
ASEN 5168	Remote Sensing Instrumentation Design
ASEN 5440/ ASTR 5780	Mission Design and Development for Space Sciences
<i>Radiative Processes &amp; Atmosphere Coupling</i>	
ASTR 5120	Radiative and Dynamical Processes
ASTR/ATOC/GEOL 5810	Planetary Atmospheres
ATOC/ASTR 5560	Radiative Processes in Planetary Atmospheres
<i>Electromagnetics &amp; Plasma</i>	
ASTR/PHYS 7160	Intermediate Plasma Physics
<i>Data Science</i>	
ASEN 6055	Data Assimilation & Inverse Methods for Earth & Geospace Observations
APPM 5510	Data Assimilation in High Dimensional Dynamical Systems
or STAT 5250	Data Assimilation in High Dimensional Dynamical Systems
APPM 5570	Statistical Methods
APPM 5580	Introduction to Statistical Learning
<i>Selected Topics</i> <sup>3</sup>	
ASEN 5519/6519	Special Topics
ASTR/ATOC/GEOL 5830	Topics in Planetary Science
ASTR 7500	Special Topics in Astrophysical and Planetary Sciences <sup>2</sup>
ATOC 5500	Special Topics in Atmospheric and Oceanic Sciences

**Total Credit Hours** 12

- <sup>1</sup> Students are required to meet each course's prerequisites, though exceptions can be made by course instructors.
- <sup>2</sup> If cross-listed in the student's home department, a course cannot count as the outside course within the certificate.
- <sup>3</sup> For courses with rotating topics, a particular offering must be on a topic relevant to space weather in order to count for this certificate. These courses will need approval from the program director.