

Climate and Space Science Engineering (CLASP)

WHAT IS CLASP ENGINEERING?

From the Earth to the sun, the moon and beyond is where you'll go as a Climate & Space student. And you'll discover how it all works together. Climate & Space faculty are actively involved in a broad range of experimental and theoretical research areas.

As a Climate & Space student, you'll be more than prepared to step into one of the many positions in the space and meteorology industries. In CLASP, you're part of the only CoE department devoted to working in these and many other areas of atmospheric and space science and engineering.

Students in CLASP can choose between two degrees, Climate and Meteorology or Space Sciences and Engineering. Two concentrations fall under the Climate and Meteorology degree, the Climate Science and Impact Engineering concentration and the Meteorology concentration.

The Climate Science and Impact Engineering concentration provides a flexible program for those interested in pursuing further graduate education or careers in industry. The Climate Science and Impact Engineering concentration prepares you for graduate studies, climate modeling, and a position in "value added" industries that provide water resource, agricultural, seasonal recreation, and transportation industries with near-term climate analyses and predications. Positions in government agencies serving to make policy or federal laboratories conducting climate research also are open to you.

Graduates with a concentration in Meteorology are prepared for careers in weather forecasting, corporations that are increasingly the source of weather analyses and predictions modeling, and for graduate studies in meteorology and the technologies that enable weather and climate prediction.

Graduates of the Space Sciences and Engineering degree program are prepared to pursue graduate degrees in the space sciences or join the space industry, which is facing a severe workforce shortage. They can also join government agencies and federal laboratories that deal with space related disciplines.

NEEDED SKILLS:

- Solving problems using scientific principles
- Critical thinking
- Decision-making
- Communication skills
- Mathematics skills
- Computer skills**

JOB TITLES

- Meteorologist
- Space Scientist
- Radiosonde Specialist
- Weather Analyst
- Planetary Scientist
- Synoptic Meteorologist**
- Atmospheric Scientist
- Hydrometeorologist
- Climatologist
- Astrochemist
- Environmental Consultant

INDUSTRIES AND OCCUPATIONS

- Federal Government (including National Weather Service and NASA)
- Scientific research laboratories
- Broadcast media industry
- Technical/business consulting**

SALARIES

\$89,820*

The nationwide average salary for employees with a bachelor's degree in Climate and Space Sciences and Engineering

INDUSTRIES AND OCCUPATIONS

- Federal Government (including National Weather Service and NASA)
- Scientific research laboratories
- Broadcast media industry
- Technical/business consulting**

JOB OUTLOOK

Employment of atmospheric scientists is expected to grow 9% from 2014 to 2024, which is faster than the average for all occupations. New computer models have vastly improved the accuracy of forecasts and allow atmospheric scientists to tailor forecasts to specific purposes. This should increase the need for atmospheric scientists working in the private industry as businesses demand more specialized weather information. The best job prospects for atmospheric scientists will be in the private industry.

MORE INFORMATION

- careers.agu.org/jobs (American Geophysical Union)
- www.msg.com/index.php/careers/current-opportunities/ (MSG)
- <http://www.ametsoc.org/AMS> (American Meteorological Society)
- Engineering Career Resource Center, 230 Chrysler
- See a CLASP advisor: 764-3282, 2137 SRB, Sandee Hicks

*Information from <http://www.bls.gov/ooh/>

**Information from: www.myplan.com

+Information from: <http://aoss.engin.umich.edu/pages/undergraduate/spaceweather>

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WHICH CLASP CLASSES SHOULD YOU START WITH?

For an introduction to CLASP, there are a number of 100 level courses that you can take, such as Rocket Science (SPACE 101) and Extreme Weather (CLIMATE 102). However, these classes are not requirements of the department. To get started with requirements, take CLIMATE/SPACE 320, followed by CLIMATE/SPACE 321 and CLIMATE/SPACE 323 in the following semester. In addition to a set of core courses, students in CLASP select a concentration in Climate Science, Climate Impact Engineering, Meteorology, or Space Weather. Class subjects will depend on what degree you have chosen. Read more about the CLASP Department at: <http://clasp.engin.umich.edu>

COURSE DESCRIPTIONS

CLIMATE/SPACE 320 – 3 credits

Earth and Space System Evolution

ONLY OFFERED FALL TERM

Prerequisite: Math 116.

Introduction to the physics and chemistry of Earth. Gravitational energy, radiative energy, Earth's energy budget, and Earth tectonics are discussed along with chemical evolution and biogeochemical cycles. The connections among the carbon cycle, silicate weathering, and the natural greenhouse effect are discussed.

CLIMATE/SPACE 321 – 3 credits

Earth and Space Systems Dynamics

ONLY OFFERED WINTER TERM

Prerequisite: Preceded or accompanied by Math 215 and Math 216.

Describes the major wind systems and ocean currents that are important to climate studies. The primary equations are developed and simple solutions derived that explain many of these motions. The relations among the dynamics and other parameters in the climate systems are illustrated by examples both paleo and present day systems.

CLIMATE/SPACE 323 – 4 credits

Earth System Analysis

ONLY OFFERED WINTER TERM

Laboratory introduction to the analysis of Earth and Atmospheric Science Systems in a computer programming environment. Topics include turbulent air motion, the planetary boundary layer, cloud and precipitation microphysical composition, tsunami wave propagation, stratospheric ozone depletion, satellite remote sensing and the prediction of El Niño effects.

Interesting (but not required) introductory classes:

SPACE 101 – 3 credits

Rocket Science

An introduction to the science of space and space exploration. Topics covered include history of spaceflight, rockets, orbits, the space environment, satellites, remote sensing, and the future human presence in space. The mathematics will be at the level of algebra and trigonometry.

CLIMATE 102 – 3 credits

Extreme Weather

This course provides an introduction to the physics of extreme weather events. The course uses weather disasters and threats to illustrate the physical laws governing the atmosphere.

We examine solar eruptions, ice ages, climate change, monsoons, El Niño, hurricanes, floods, droughts, heat waves, thunderstorms, lightning, hail, tornados, and other extreme atmospheric events to illustrate the basic physical laws that produce these events. Participants are expected to apply these principles to a series of homework assignments including hands-on weather forecasting and analysis of storm events.