EAS-Earth Science

EAS100 - Introduction to Earth Science

This introductory laboratory-oriented earth science course designed to acquaint the student with the four general areas of the earth sciences: astronomy, geology, meteorology, and oceanography. Laboratory activities are designed to enhance student's understanding of elementary scientific concepts in earth science.

EAS104 - Introduction to Meteorology

This course deals with the physics and chemistry of the atmosphere as influenced by the earth-atmosphere interaction. The effects of the physical controls as they alter the elements are emphasized. Basic laws of Physics and Chemistry are emphasized. The construction and analysis of weather maps is an integral part of the laboratory component of the course. Students are expected to visualize, interpret, and investigate various weather phenomena as they relate to the current state of the atmosphere. Basic prediction of future weather conditions is the final culminating experience of the course, after extensive laboratory investigations in both manual and computer settings.

EAS105 - Extreme Weather

This course provides scientifically accurate description of extreme and unusual weather phenomena. Course discusses a variety of extreme weather phenomena in a descriptive style that does not require advanced mathematical knowledge. Course includes topics like thunderstorms, thunderstorm complexes, tornadoes, hurricanes, extreme snowfall events, blizzards, floods, droughts and downslope windstorms. Climatology of these events is also discussed.

EAS142 - Introduction to Climate Science

In this course the elements and controls of climate are analyzed in a systematic fashion. The physical parameters controlling climate are reviewed, as they relate to physics and chemistry. Various methods and techniques of classifying climates are presented. Climatology is concerned not only with the most frequently occurring types, the average weather, but the infrequent and unusual types as well. Because climatology also analyzes climatic conditions at locations on the earth's surfaces and its effect on human society and/or the environment, the course is geographical in nature. Climates of the past and potential future issues will be discussed. The student will be able to make an informed decision in the form of a research proposal about impending climate change and climate data analysis by the conclusion of the course.

EAS163 - Introduction to Oceans and Climate

Oceanography examines the world ocean from an Earth system perspective. Specifically, it is designed to be an introduction in the study of the four main branches of oceanography: (1) geology of the oceanic basins (origins of the oceans, structure and geomorphology of the ocean's floor, methods of investigation); (2) chemistry of the ocean waters; (3) physics of the oceans (currents, waves, tides, etc.); (4) biology of the oceans (marine plants and animals).

EAS245 - Weather Analysis and Forecasting I

Introduction to the application of basic atmospheric concepts on real-time weather data. This course aims synthesize observational and numerical weather analyses in order to understand weather phenomena on synoptic scale. Topics include: analysis of forces, accelerated reference frames, conservation equations of mass, momentum and energy; scale analysis; pressure coordinates; geostrophic and gradient flow; thermal wind; kinematic description of the wind, trajectories; circulation, vorticity and potential vorticity. The last part of the course will introduce quasi-geostrophic theory applications in synoptic meteorology and introduce concepts of frontogenesis and atmospheric jets.

EAS323 - Atmospheric Instrumentation and Measurement

This upper-division course in meteorology deals with the specifics of data collection and instrument functionality. Time will be spent dealing with proper site selection, the physical mechanisms present within an automated sensor array, and quality control for data collected. Students taking this course should have a detailed understanding of the role each meteorological parameter has in making a weather forecast.

EAS342 - Dynamic Meteorology I

This course is an introduction to description and theory of atmospheric motion; analysis of forces, accelerated reference frames, conservation equations of mass, momentum and energy; scale analysis; pressure coordinates; geostrophic and gradient flow; thermal wind; kinematic description of the wind, trajectories; circulation and vorticity. The last part of the course will introduce quasi-geostrophic theory.

EAS365 - Remote Sensing: Satellite and Radar Interpretation

This course emphasizes the characteristics and scientific role of radar and satellite interpretation, as well as computer-assisted processing of spectral data acquired by satellites, as they relate to atmospheric analysis.

EAS369 - Climate Dynamics

The main goal for this course is to present the working of the climate system as a whole and its critical components (the atmosphere, ocean, sea ice, glaciers, land surface, etc), their complex interactions and feedbacks, and the mechanisms governing natural climate variability (e.g., ENSO) and the climate response to external perturbations (e.g., the increase in greenhouse-gas concentrations). Several important periods in Earth's climate history are explained in terms of natural and anthropogenic forcings and climate system responses. Various scenarios of future climate changes are also discussed.

EAS419 - Applied Climatology

This course examines the effect of climate on the physical, biological, and cultural environments and includes both present-day and future (re: Climate change) relationships. Part of the course will examine current practices/ methodological developments that represent the basic “tools” which underpin applied climatological research. Significant time will be spent investigating the relationship between climate/climate change and a wide range of human activities and responses. This course is a “writing intensive” course, as defined by California University of Pennsylvania. Therefore, many topical discussions, research investigations and climate diagnostic analyses will require writing with the opportunity for the student to revise their original work.

EAS431 - Digital Media for Weather & Climate Applications

The course is an introduction to television weather broadcasts and web-based “narrowcasts” with emphasis on creating accurate weather forecasts, climate outlooks and on the techniques of communicating weather information to various publics. The course consists of weekly lecture/lab meetings and one-on-one critiquing/ coaching to develop and improve descriptive science language as well as the graphics that accompany the verbal discourse. Special emphasis is placed upon accurate weather forecasting from skills initiated in previous coursework. Extemporaneous speaking styles will be stressed with timed delivery of weather information. Analysis of a weather graphics presentation will be undertaken, and ultimately students will be expected to arrange their own weather “show” for presentation and evaluation by classmates. A history of meteorology in the media will also be examined in the context of changing technologies and public perceptions.

EAS442 - Dynamic Meteorology II

This course introduces advanced topics in dynamics of atmospheric motions. This course is a continuation of Dynamic Meteorology (EAS 342). Topics include: atmospheric oscillations and waves, synoptic scale instabilities, mesoscale instabilities and isentropic potential vorticity thinking. The last part of the course will introduce the dynamics of numerical modeling and prediction.

EAS445 - Weather Analysis and Forecasting II

Continuation of the concepts learned in Synoptic Meteorology (EAS 340). The lecture part of the course examines frontal boundaries, evolution of mid-latitude cyclones, and applications of potential vorticity concepts to weather analysis and prediction. The laboratory part of this course is a forecasting lab where students independently analyze weather and forecast in a competitive setting.

EAS449 - Mesoscale Meteorology

Introduction to the structure and dynamics of mesoscale weather phenomena. This course aims to synthesize observational and numerical modeling studies of mesoscale weather phenomena. Topics include: mesoscale instabilities, boundary layer dynamics, low-level jets, air mass boundaries, deep moist convection, supercell thunderstorms and tornadogenesis. The last part of the course introduces severe weather associated with deep moist convection.

EAS452 - Atmospheric Thermodynamics and Radiation

This course examines the role of thermodynamics and radiation in the atmosphere. Topics covered in the course include the First and Second Law of Thermodynamics, adiabatic and diabatic processes, thermodynamic diagrams, and stability. These concepts will prepare the student for understanding exactly how the earth is heated by solar radiation. Specifically, those principles in atmospheric radiation will be investigated, including solar and terrestrial radiation, blackbodies, absorption and emission, and scattering.

EAS453 - Cloud Physics

This course is a continuation of EAS 452. The physics relevant to the formation of droplets and precipitation, mixing and parcel theory, adiabatic lifting, nucleation, warm rain processes, cold rain processes, and the growth of hail are investigated. Finally, radiation concepts from EAS 452 are used to look at the impact of clouds on solar and terrestrial radiation.

EAS465 - Seminar in Atmospheric Science

This scientific writing and speaking course covers recent and historical developments in the atmospheric sciences. Students are required to participate in group presentations, complete two written research projects, and produce a critique of classmates' research projects.

EAS469 - Global Climate Change

Climate change has become the defining environmental issue for our global society. Its effects, however, are unequal in different regions of the world. These disparities are due to both natural processes in climate but also due to societal inequities and vulnerabilities caused in part due to historical inertia or geographic challenges. The course begins in describing the many ways in which global climate has and will change through time as a result of many years of scientific observation and understanding of physics and chemistry. Next the course will focus on how those changes have affected humans through the centruries and what influence future changes may have on a modern, globalized society. Related, the human need to consume energy places climate change mitigation efforts squarely in the realm of public policy debate. As such, all parts of the global society are affected-many times unequally. These global inequities in both human vulnerability and economiies raise a variety of ethical considerations that are a focus of discussion in the course. Students enrolling in this course should have a basic understanding of earth sciences concepts so as to frame their understanding of climate change adaptation/mitigation from a policy, economic, and/or moral standpoint.