

## Atmospheric Science Courses

### ATMO 105 **Introductory Meteorology.** (5)

A lecture and laboratory course introducing students to the atmosphere, weather and climate phenomena, and their controlling physical processes. Topics covered include: the structure of the atmosphere, energy and energy budgets, climate and climate change, air pollution, clouds and precipitation, pressure and wind systems, severe weather, and weather forecasting.

### ATMO 106 **Introductory Meteorology, Honors** (5)

Honors version of ATMO 105. A lecture and laboratory course introducing students to the atmosphere, weather and climate phenomena, and their controlling physical processes. Topics covered include: the structure of the atmosphere, energy and energy budgets, climate and climate change, air pollution, clouds and precipitation, pressure and wind systems, severe weather, and weather forecasting. *Prerequisite:* membership in University Honors Program or by permission of instructor.

### ATMO 220 **Unusual Weather.** (3)

An introductory lecture course which surveys the general principles and techniques of atmospheric science and illustrates their application through discussions of natural but unusual weather phenomena such as blizzards, hurricanes, tornados, and chinooks, of the effects of air pollution on weather, and of intentional human alteration of the atmosphere.

### ATMO 321 **Climate and Climate Change.** (3)

Same as GEOG 321  
This course is designed to introduce students to the nature of the Earth's physical climate. It will introduce the basic scientific concepts underlying our understanding of our climate system. Particular emphasis is placed on energy and water balances and their roles in evaluating climate change. The course also evaluates the impact of climate on living organisms and the human environment. Finally, past climates are discussed and potential future climate change and its impact on humans is evaluated. *Prerequisite:* GEOG 104 or ATMO 105.

### ATMO 499 **Honors Course in Atmospheric Science.** (2-3)

Open to students with nine hours of upper level credit in Atmospheric Science, an average of at least 3.5 in all Atmospheric Science courses, and an overall average of at least 3.25. Includes the preparation of an honors paper and its defense before a committee of at least two regular faculty members.

### ATMO 505 **Weather Forecasting.** (3)

A first course in synoptic meteorology designed to introduce students to weather analysis and forecasting through the application of hydrodynamic and thermodynamic principles to operational analysis and forecasting. Topics include: analysis and interpretation of surface and upper-air observations and data from satellites, radars, and wind profilers; chart and sounding analysis; and three-dimensional, conceptual models of weather systems. The course includes student-led weather briefings and analysis exercises. *Prerequisite:* ATMO 105; one other atmospheric science or computer science course; MATH 121.

### ATMO 506 **Forecasting Models and Methods** (3)

Introduction to basic numerical weather prediction methods. Computer programs are used to apply numerical methods to weather data and to evaluate dynamical processes on numerical grids. Meteorological graphics packages are used to analyze current weather data and numerical model output. Current operational numerical models and output products are discussed. *Prerequisite:* ATMO 505, Math 122, and EECS 138 or EECS 168.

### ATMO 515 **Energy and Water Balance** (3)

A study of the distribution and circulation of water in the air-earth system as influenced by atmospheric processes and surface conditions. The solar and terrestrial radiation budget and the water balance at the

earth's surface will be applied to agricultural and urban energy and water problems.

*Prerequisite:* ATMO 105 or EECS 138.

### ATMO 521 **Microclimatology.** (3)

Same as GEOG 521

A study of climatic environments near the earth-atmosphere interface. The course considers rural climates in relationship to agriculture and urban climates as influenced by air pollution and other factors. Emphasis is on physical processes in the lower atmosphere, distribution of atmospheric variables, the surface energy budget and water balance.

*Prerequisite:* ATMO 105 and Math 106 or Math 121.

### ATMO 525 **Air Pollution Meteorology** (3)

A study of background levels and concentrated sources of atmospheric pollution together with considerations of pollution buildup in urban areas as related to particular weather conditions. Inadvertent weather modifications and effects of atmospheric pollution on particular weather events and general climate will be discussed.

*Prerequisite:* ATMO 105, MATH 121, and EECS138.

### ATMO 531 **Topics in Atmospheric Science:\_\_\_\_\_** (1-3)

An investigation of special topics in atmospheric science. May include topics in dynamic, physical or synoptic meteorology or climatology as well as related topics in earth and physical sciences. May be repeated if topic differs.

### ATMO 605 **Operational Forecasting** (2)

Students enhance their forecasting expertise by preparing forecasts for presentation to the public through a variety of media. Classroom activities include weekly map discussions and analysis of current weather situations. Forecasting topics such as forecast verification, aviation forecast products, severe weather, flash floods and watches and warnings are examined. Credit for ATMO 605, ATMO 606, and ATMO 607 is limited to a total of eight hours, six of which may be counted toward a degree in atmospheric science.

*Prerequisites:* ATMO 505.

### ATMO 606 **Forecasting Practicum – Private Industry** (2)

Practical experience in private industry working with current and/or archived meteorological data. Possibilities include the preparation of forecasts for TV stations and meteorological consulting firms, and working with environmental consulting firms to assess air pollution hazards. May be repeated two times for credit. Credit for ATMO 605, 606, and 607 is limited to a total of eight hours, six of which may be counted toward a degree in Atmospheric Science.

*Prerequisite:* ATMO 605.

### ATMO 607 **Forecasting Intern – National Weather Service** (2)

Practical experience working in a National Weather Service forecasting center in analyzing weather data and preparing weather forecasts. May be repeated two times for credit. Credit for ATMO 605, 606, and 607 is limited to a total of eight hours, six of which may be counted toward a degree in Atmospheric Science.

*Prerequisite:* ATMO 605.

### ATMO 630 **Synoptic Meteorology** (3)

Interpretation, development, and analysis of synoptic charts.

*Prerequisite:* ATMO 505 and ATMO 640.

### ATMO 634 **Physical Climatology** (3)

Atmospheric processes are described and discussed in relation to the climate of the earth's surface. Such topics as the greenhouse effect, ozone depletion, and the effect of solar irradiance on climatic change will be included. The physical processes and relationships between various climatic features will be studied.

*Prerequisites:* ATMO 505 and DSCI 301 or MATH 526.

### ATMO 640 **Dynamic Meteorology** (3)

This course introduces the student to the fundamentals of fluid dynamics necessary for understanding large scale atmospheric motions.

Fundamental physical laws of conservation of mass, momentum and energy are examined and applied to atmospheric flows. Rotation in the atmosphere is examined quantitatively in terms of both circulation and vorticity.

*Prerequisite:* MATH 223, PHSX 212, Prerequisite or corequisite of ATMO 505.

**ATMO 642 Remote Sensing (3)**

This course is designed to prepare students to effectively use remotely sensed data in operational or research settings for further work in this field. Topics include radiation and radiation transfer applied to active and remote sensing; radiative properties of space, sun, earth and atmosphere; instrument design considerations and operational characteristics; inversion methods for temperature or concentration profiling; surface temperature measurement; cloud top height determination; rain rate and wind velocity measurement; severe weather detection; satellite photograph interpretation.

*Prerequisite:* ATMO 680, MATH 581.

**ATMO 650 Advanced Synoptic Meteorology (3)**

Analysis and interpretation of synoptic weather charts including treatment of numerical weather forecasting.

*Prerequisite:* ATMO 630 and ATMO 660.

**ATMO 660 Advanced Dynamic Meteorology (3)**

Advanced study of the atmosphere including treatment of the vorticity equation.

*Prerequisite:* ATMO 630, ATMO 640, MATH 123, and PHSX 211.

**ATMO 680 Physical Meteorology (3)**

This course is designed to enhance the student's understanding of atmospheric processes through the study of these processes at molecular through micro scales. Topics include the properties and behavior of gases; transfer processes; phase change; solar and earth radiation; cloud drop, ice crystal and precipitation formation; atmospheric electricity; stratospheric chemistry.

*Prerequisite:* MATH 223, PHSX 212.

**ATMO 690 Special Problems (1-3)**

This course provides the student with an opportunity for independent work in meteorology beyond the content of the regularly-scheduled courses. Done under the guidance of a faculty member, the problem should be of mutual interest to the student and the faculty member; the nature of the work should be carefully discussed by both before enrollment.

*Prerequisite:* Nine credit hours in meteorology.

**ATMO 697 Seminar for Seniors (1)**

Current research in atmospheric science will be discussed. May be repeated for a total of two credit hours.

*Prerequisite:* Senior level in Atmospheric Science.

**ATMO 699 Undergraduate Problems (2)**

*Prerequisite:* Twelve credit hours in meteorology.

**ATMO 710 Atmospheric Dynamics (3)**

Presentation of contemporary approaches to the study of atmospheric dynamics. May include methodologies that provide insight into global, synoptic, mesoscale or microscale motions.

*Prerequisite:* ATMO 660 or equivalent.

**ATMO 720 Atmospheric Modeling (3)**

Illustration and application of contemporary approaches to mathematical and statistical description of atmospheric phenomena.

*Prerequisite:* MATH 122, ATMO 640, ATMO 680, and a course in statistics, or consent of instructor.

**ATMO 727 Atmospheric Storms (3)**

The physical processes and operating principles involved in the development and life cycles of extreme or unusual weather events

including tornadoes, blizzards, lightning displays, and tropical storms.  
*Prerequisite:* EECS 138, MATH 121, and ATMO 320.

**ATMO 731 Advanced Topics in Atmospheric Science: \_\_\_\_\_ (1-3)**

Advanced investigation of special topics in atmospheric science. May include topics in dynamic, physical or synoptic meteorology or climatology as well as related topics in earth and physical sciences. May be repeated if topic differs.

**ATMO 750 Numerical Weather Prediction (3)**

An exploration of the mathematical methods used to describe the current state of the atmosphere and to predict future states. Current operational numerical weather prediction techniques will be included.

*Prerequisite:* ATMO 660.