

# ATMO - ATMOSPHERIC SCIENCES

## ATMO 601 Fundamentals of Atmospheric Dynamics

**Credits 3. 3 Lecture Hours.** Basic concepts of fluid dynamics; meteorological approximations and coordinate systems; simple models and wave motion; barotropic models. **Prerequisite:** Approval of instructor.

## ATMO 602 Atmospheric Physics I

**Credits 3. 3 Lecture Hours.** Integrated treatment of the dry and moist thermodynamics of the atmosphere, and cloud and precipitation microphysics.

## ATMO 603 Quantitative Methods for the Atmospheric Sciences

**Credits 3. 3 Lecture Hours.** Mathematical and numerical methods applied to ODE's, PDE's and statistical methods; methods of analysis and modeling of atmospheric phenomena. **Prerequisites:** Concurrent registration in ATMO 601 and CSCE 203 or equivalents.

## ATMO 604 General Circulation and Climate

**Credits 3. 3 Lecture Hours.** Observed large scale circulation and climate of the earth; physical processes which maintain relevant budgets; models and theories explaining mean observations. **Prerequisite:** ATMO 601.

## ATMO 606 Atmospheric Chemistry I

**Credits 3. 3 Lecture Hours.** Fundamentals of atmospheric chemistry; tropospheric ozone, NO<sub>x</sub> and HO<sub>x</sub> cycling, sulfur chemistry, stratospheric chemistry, and aerosol composition; analytical measurement methods; review of chemical basics as needed.

## ATMO 611 Atmospheric Dynamics II

**Credits 3. 3 Lecture Hours.** Continuation of ATMO 601; flow in planetary boundary layer; balanced flows; atmospheric instabilities; tropical dynamics. **Prerequisite:** ATMO 601 or approval of instructor.

## ATMO 612 Atmospheric Physics II

**Credits 3. 3 Lecture Hours.** Continuation of ATMO 602. Radiative transfer into the atmosphere. **Prerequisite:** ATMO 602.

## ATMO 613 Advanced Atmospheric Chemistry

**Credits 3. 3 Lecture Hours.** An advanced survey of fundamental atmospheric processes involving biogeochemical cycles, air pollution, tropospheric chemistry, atmospheric aerosols and stratospheric chemistry. **Prerequisite:** ATMO 606.

## ATMO 618 Numerical Methods for the Geosciences

**Credits 3. 3 Lecture Hours.** Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and seismology; iterative solvers; implicit and explicit methods for diffusion and advection.

**Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** GEOP 618 and OCNG 618.

## ATMO 629 Climate Change

**Credits 3. 3 Lecture Hours.** Climate of the geological and recent past; methods of assessing climate and climatic change; mechanisms, models, theories, impact and prediction of climatic change. **Prerequisites:** ATMO 324 or equivalent; approval of instructor.

## ATMO 631 Climate Modeling

**Credits 3. 3 Lecture Hours.** A study of mathematical models used in the simulation of climate. Development and structure of selected members of the hierarchy of models ranging from energy balance models to general circulation models. Applications to paleoclimate and future climate scenarios. **Prerequisite:** Approval of instructor.

## ATMO 632 Statistical Methods in Climate Research

**Credits 3. 3 Lecture Hours.** Advanced techniques especially applicable to climatology; space-time random field analysis applied to stochastic models, parameter estimation, statistical forecasting, data interpolation and signal detection; applications to real data and climate model output. **Prerequisites:** STAT 601 or equivalent; approval of instructor.

## ATMO 638 Dynamics of Convective Clouds

**Credits 3. 3 Lecture Hours.** Parcel, slice and entrainment concepts; bubble and plume theories; spherical vortex; the starting plume; one-dimensional models; selected topics of current interest. **Prerequisite:** ATMO 611.

## ATMO 645 Cloud and Precipitation Physics

**Credits 3. 3 Lecture Hours.** Physics of atmospheric condensation nuclei, ice in the atmosphere; precipitation processes; artificial modification of clouds; precipitation. **Prerequisite:** ATMO 612 or approval of instructor.

## ATMO 651/OCNG 651 Dynamics of Ocean-Atmosphere Interaction

**Credits 3. 3 Lecture Hours.** Major features of the atmosphere and ocean; interaction between the two systems; coupled modes of variability in ocean-atmosphere system; dynamics of El Niño-Southern Oscillation and related phenomena in the tropics; extratropical ocean-atmosphere feedbacks. **Prerequisite:** OCNG 608 or ATMO 601. **Cross Listing:** OCNG 651/ATMO 651.

## ATMO 655 Satellite Data in Meteorology

**Credits 3. 3 Lecture Hours.** Meteorological satellite programs of the United States and other countries; theory of meteorological measurements from artificial satellites; applications of satellite data in determinations of atmospheric structure and in forecasting; recent and current research studies; future programs. **Prerequisite:** ATMO251 or approval of instructor.

## ATMO 656 Tropical Meteorology

**Credits 3. 3 Lecture Hours.** Role of the tropics in global circulation; structure and dynamics of the tropical zone; local and diurnal phenomena; synoptic components; tropical cyclones; role of cumulus-scale convection; current topics. **Prerequisite:** ATMO 251 or approval of instructor.

## ATMO 657 Mesometeorology

**Credits 3. 3 Lecture Hours.** Theory and structure of mesoscale weather systems and their relation to larger and smaller scale systems. **Prerequisite:** ATMO 251 or approval of instructor.

## ATMO 658 Synoptic Meteorology

**Credits 3. 3 Lecture Hours.** Mechanism and energetics of general circulation. Structure of large-scale systems. Persons desiring practice in analysis techniques should enroll for 1 hour or more of ATMO 685. **Prerequisite:** ATMO 251 or approval of instructor.

## ATMO 659 Tropical Cyclones

**Credits 3. 3 Lecture Hours.** Tropical climatology; structure evolution and motion of tropical cyclones; tropical cyclone hazards; large scale tropical phenomena. **Prerequisite:** ATMO 251.

## ATMO 664 Laboratory Methods in Atmospheric and Environmental Sciences

**Credits 3. 2 Lecture Hours. 4 Lab Hours.** Classroom and laboratory course; introduction to chemical techniques used to monitor the atmosphere and environment; instrumentation, sampling strategies; survey of current literature focusing on development of new techniques. **Prerequisite:** Graduate classification.

## ATMO 677/OCNG 677 Geophysical Data Assimilation

**Credits 3. 3 Lecture Hours. 0 Lab Hours.** Modern data assimilation methods applied to oceanic and atmospheric circulation models, as well as in other simple models; methods to interpolate one-, two- and three-dimensional randomly spaced data to regular grids for use in numerical models of atmospheric and oceanic circulation. **Prerequisites:** OCNG 669. **Cross Listing:** OCNG 677/ATMO 677.

## ATMO 678 Professional Development in Atmospheric Sciences

**Credit 1. 1 Lecture Hour.** Focus on non-research aspects of a career in science; topics include giving effective presentations and posters, writing proposals, creating good graphics, reviewing papers, how to respond to reviews, scientific ethics and job interview skills.

## ATMO 681 Seminar

**Credit 1. 1 Other Hour.** Presented by students and faculty based upon their research work and upon surveys of the literature.

## ATMO 685 Directed Studies

**Credits 1 to 16. 1 to 16 Other Hours.** Offered to enable majors in meteorology to undertake and complete, with credit, in their particular fields of specialization, limited investigations not covered by any other courses in established curriculum.

## ATMO 689 Special Topics in...

**Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.** Special topics in an identified area of meteorology. May be repeated for credit.

## ATMO 691 Research

**Credits 1 to 23. 1 to 23 Other Hours.** For thesis or dissertation. Topic subject to approval of department head.