

# ATMO - ATMOSPHERIC SCIENCES (ATMO)

## ATMO 110/GEOL 110 Disasters and Society

**Credits 3. 3 Lecture Hours.** Exploration of the science behind disasters; how they occur, the choices society makes that create or affect disasters, how certain populations are privileged during disasters by the decisions society has made and how science informs preparation for and response to future disasters. **Cross Listing:** GEOL 110/ATMO 110.

## ATMO 201 Weather and Climate

**Credits 3. 3 Lecture Hours.** Structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms.

## ATMO 202 Weather and Climate Laboratory

**Credit 1. 2 Lab Hours.** Practical laboratory experiments and exercises, conducted in the meteorology and computer laboratories, concerning the fundamental physical processes underlying atmospheric phenomena, and the collection, display and interpretation of meteorological information. For non-majors only.

## ATMO 203 Weather Forecasting Laboratory

**Credit 1. 2 Lab Hours.** Short-range weather forecasting practice; numerical guidance; weather map analysis and discussions. **Prerequisite:** ATMO 201 or concurrent enrollment.

## ATMO 210 Climate Change

**Credits 3. 3 Lecture Hours.** Examination of the science of climate change; past and present causes of global-scale climate change; basis for projections of future climate change and its potential impacts; existing and proposed policy responses; critical evaluation of scientific information.

## ATMO 215 Climate Risk in the 21st Century

**Credits 3. 3 Lecture Hours.** Exploration of the fundamental risk of climate change, including both physical and economic risks, and the complex challenges of energy transition; the political and social dynamics that shape climate policy and the debate over climate change; comprehensive understanding through analysis of historical and contemporary issues of the risks and opportunities of our rapidly changing climate and climate policy.

## ATMO 251 Weather Observation and Analysis

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Standard and experimental weather observing techniques; subjective and objective analysis; application of conceptual models; simple kinematic and dynamic constraints. **Prerequisite:** ATMO 203 or concurrent enrollment; MATH 172 or MATH 152, or concurrent enrollment.

## ATMO 285 Directed Studies

**Credits 1 to 4. 1 to 4 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. **Prerequisite:** Freshman or sophomore classification.

## ATMO 289 Special Topics in...

**Credits 1 to 4. 1 to 4 Lecture Hours.** Selected topics in an identified area of meteorology. May be repeated for credit. **Prerequisite:** Approval of instructor.

## ATMO 291 Research

**Credits 0 to 4. 0 to 4 Other Hours.** Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

## ATMO 321 Computer Applications in the Atmospheric Sciences

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Introduction to technical computing methods in the atmospheric sciences; use of specialized software and data analysis systems for meteorological applications.

## ATMO 324 Physical and Regional Climatology

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Climate causes; global and surface energy balance; hydrologic cycle; general circulation; climate change; climate data analysis. **Prerequisites:** ATMO 201; MATH 251 or concurrent enrollment; ATMO 321 or equivalent, or concurrent enrollment; junior or senior classification.

## ATMO 326 Environmental Atmospheric Science

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Basic concepts of meteorology as needed in environmental sciences; patterns of meteorological and climatic elements and their relevance in terrestrial ecology and urban sciences; solar and wind energy physics; practical experience in use of instruments to measure micro-climates as they relate to meteorological conditions and analysis of data. **Prerequisites:** ATMO 201 or GEOG 203, or approval of instructor.

## ATMO 335 Atmospheric Thermodynamics

**Credits 3. 3 Lecture Hours.** Application of thermodynamics to Earth's atmosphere; phase changes of water; stability concepts; introduction to physical chemistry. **Prerequisites:** CHEM 120; MATH 251; PHYS 206.

## ATMO 336 Atmospheric Dynamics

**Credits 4. 3 Lecture Hours. 2 Lab Hours.** Kinematic concepts and relationships; equations of motion; geostrophic and accelerated motions; the vorticity equation and Rossby waves. **Prerequisites:** ATMO 321, ATMO 335, and MATH 308, or concurrent enrollment; junior or senior classification.

## ATMO 352 Severe Weather and Mesoscale Forecasting

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Parcel theory for dry and moist convection; sounding diagrams and their application to atmospheric convection; organization of midlatitude convection and severe weather; thunderstorm forecasting. **Prerequisite:** ATMO 251, and MATH 152 or MATH 172.

## ATMO 363 Introduction to Atmospheric Chemistry and Air Pollution

**Credits 3. 3 Lecture Hours.** Descriptive introduction of the composition and chemistry of natural and pollutant compounds in the atmosphere; transport, cycling and reactivity of atmospheric material; atmospheric measurements, data processing, air quality and human health issues; air pollution trends and climate change. **Prerequisites:** CHEM 119 and CHEM 120 or approval of instructor.

## ATMO 370 Student High Impact Experiences in Meteorology

**Credits 1 to 4. 1 to 4 Other Hours.** Observation, study and analysis of meteorological phenomena and processes in the regional settings in which they occur; domestic and study-abroad high impact learning experiences. **Prerequisite:** ATMO 201 or concurrent enrollment.

## ATMO 435 Synoptic-Dynamic Meteorology

**Credits 3. 3 Lecture Hours.** Dynamics and diagnosis of synoptic-scale systems; perturbation theory and baroclinic instability; wave energetics, frontogeneses. **Prerequisites:** ATMO 336 or equivalent; MATH 308.

## ATMO 441 Satellite Meteorology and Remote Sensing

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Introduction to satellite orbit dynamics, atmospheric radiative transfer, atmospheric remote sensing methods, and analysis and application of remotely sensed meteorological data. **Prerequisites:** ATMO 324 and MATH 308; ATMO 446 or concurrent enrollment.

## ATMO 443 Radar Meteorology

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Principles of radar theory, hardware, operations and analysis using real-time radar and computer-based case studies; conventional, Doppler and polarimetric weather radar; precipitation estimation, hydrometeor identification and air motion analysis; observations and analyses of thunderstorms, mesocyclones, tornadoes and gust fronts. **Prerequisites:** ATMO 352; PHYS 207 or PHYS 219.

## ATMO 444 The Science and Politics of Global Climate Change

**Credits 3. 3 Lecture Hours.** Examination of the policy and scientific debate over climate change; how scientific debates produce "knowledge"; how political debates produce policies; how policy debates use science; scientific evidence for climate change; impacts of climate change; possible responses to climate change; the political debate over climate change. **Prerequisite:** ATMO 210; junior or senior classification or approval of instructor.

## ATMO 446 Physical Meteorology

**Credits 3. 3 Lecture Hours.** Physics and meteorology of clouds and precipitation; atmospheric electricity; radiative transfer. **Prerequisite:** ATMO 335.

## ATMO 455 Numerical and Machine Learning-Based Weather Prediction

**Credits 3. 2 Lecture Hours. 2 Lab Hours.** Basic principles of computer models for weather prediction, critical evaluation of models and model outputs; data assimilation; atmospheric predictability; ensemble forecasting. **Prerequisites:** Junior or senior classification, approval of instructor.

## ATMO 456 Practical Weather Forecasting

**Credits 3. 1 Lecture Hour. 4 Lab Hours.** Advanced weather forecasting techniques with application to a variety of forecasting problems, both public and private sector. **Prerequisites:** ATMO 435 or registration therein; junior or senior classification.

## ATMO 459 Tropical Meteorology

**Credits 3. 3 Lecture Hours.** Tropical climatology; structure, evolution, and motion of tropical cyclones; tropical cyclone hazards; large-scale tropical phenomena. **Prerequisites:** ATMO 336; ATMO 352 or concurrent enrollment.

## ATMO 461 Broadcast Meteorology

**Credit 1. 2 Lab Hours.** Instruction in the practice of broadcast meteorology; practice in and preparation of weather forecast products and demonstration videotapes. May be taken two times for credit with faculty advisor approval. **Prerequisites:** ATMO 335 or registration therein; MATH 308 or registration therein; junior or senior classification.

## ATMO 463 Air Quality

**Credits 3. 3 Lecture Hours.** Atmospheric pollution sources, transport, sinks, and effects; monitoring of air pollutant emissions and of ambient concentrations; use of models to simulate air pollution; regulation of emissions and ambient concentrations; greenhouse gas emissions regulations. **Prerequisite:** CHEM 119 or CHEM 107 or approval of instructor; junior or senior classification.

## ATMO 464 Laboratory Methods in Atmospheric Sciences

**Credits 3. 2 Lecture Hours. 4 Lab Hours.** Instruction in chemical techniques used to monitor the atmosphere and other earth systems; sampling strategies; survey of current literature focusing on development of new techniques. **Prerequisites:** CHEM 119 and one semester of calculus (MATH 171 or equivalent).

## ATMO 484 Internship

**Credits 0 to 3. 0 to 3 Other Hours.** Supervised internship at National Weather Service or in broadcast meteorology or elsewhere with faculty advisor approval; must complete a report and have a letter from supervisor for credit. May be taken three times for credit. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisites:** ATMO 251; approval of faculty advisor.

## ATMO 485 Directed Studies

**Credits 1 to 23. 1 to 23 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. **Prerequisite:** Junior or senior classification.

## ATMO 489 Special Topics in...

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

## ATMO 491 Research

**Credits 0 to 4. 0 to 4 Other Hours.** Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. **Prerequisites:** Junior or senior classification and approval of instructor.