ATM

Atmospheric and Oceanic Studies

ATM 102: Weather and Climate
Introduces the nature and causes of common meteorological phenomena, severe weather occurrences, and climatic patterns. Topics include formation and movement of air masses and large-scale storms; techniques for weather prediction; weather satellites; hurricanes, tornadoes, and thunderstorms; cloud and precipitation types; the climatic history of the earth; and actual and potential effect of human activities on weather and climate, and of weather and climate on humans. This course is offered as both ATM 102 and EST 102.

DEC: E
SBC: SNW
3 credits

ATM 103: Extreme Weather
Provides a working knowledge of the causes of extreme weather around the world, how these extremes have changed over time, how technology has aided in preparedness, advancements in forecasting, human impacts of weather, and the vulnerability and adaptability of societies. Throughout the course, recent extreme events from around the world will be analyzed as case studies to explore the complex interaction of weather, technology and society. These examples will span the globe and will include, but not be limited to: hurricanes (e.g., Hurricane Sandy); air pollution (also termed ‘chemical weather’) in Beijing and Mexico City; extreme heat waves in western Europe; monsoonal flooding in Southeast Asia; and drought in Central and East Africa.

DEC: H
SBC: STAS
3 credits

ATM 201: Introduction to Climate and Climate Change
An introduction to the earth’s climate system as it exists today, how the climate system has changed in the past, and what future climates may look like in the future. Topics include the causes of climate change, the response times of different parts of the climate system, interactions and feedbacks between the atmosphere, oceans, ice, continents, and vegetation, and the role of carbon as it moves within the climate system on different time-scales.

DEC: E

ATM 205: Introduction to Atmospheric Sciences
A study of the nature and causes of atmospheric phenomena, along with basic physical and chemical processes and energetics. Topics include composition and structure of the atmosphere, atmospheric thermodynamics, hydrostatics, solar and terrestrial radiation, cloud and precipitation processes, elementary dynamics, atmospheric wind and pressure patterns, and severe storms.

Prerequisite: MAT 125 or 131 or AMS 151
Advisory Prerequisite: ENS/PHY 119 or PHY 121 or 125 or 131/133 or 141

DEC: E
SBC: STEM+
3 credits

ATM 237: World Climate and Atmosphere
An exploration of current concerns about the greenhouse effect, acid rain, and global ozone loss, in a format accessible to non-science majors. The social and political steps being taken to limit global atmospheric pollution and climate change are discussed. Not for major credit. This course is offered as both ATM 237 and PHY 237.

Prerequisite: one D.E.C. E or SNW course; satisfaction of entry skill in mathematics requirement or level 2+ on the mathematics placement examination

DEC: H
SBC: STAS
3 credits

ATM 247: Atmospheric Structure and Analysis
Real-world applications of basic dynamical principles to develop a physical understanding of various weather phenomena. Topics include the hypsometric equation, structure and evolution of extratropical cyclones, fronts, hurricanes, and convective systems, surface and upper air analysis techniques, radar and satellite interpretation, and introduction to operational products and forecasting. Two hours of lecture and one two-and-one-half hour laboratory per week. Laboratories include weather discussions and case study analysis.

Prerequisite: ATM 205
SBC: STEM+, TECH
3 credits

ATM 305: Global Atmospheric Change
An application of chemical principles to the analysis and prediction of climate changes on earth. The course analyzes climates that have occurred in the earth’s past and uses this information to infer climate changes that are likely to occur in the near and distant future. Topics covered include atmospheric chemistry, paleoclimates, greenhouse warming, ozone changes, and urban pollution.

Prerequisites: MAT 125 or 131 or AMS 151; CHE 131 or 141
Advisory Prerequisite: One of the following: ENS/PHY 119, 132/134, 142, or 127

DEC: E
SBC: STEM+
3 credits

ATM 320: Spatial Data Analysis Using Matlab
Provides a working knowledge of the multivariate analysis methods used in the earth and atmospheric sciences and the Matlab programming tool. Topics include regression, eigenvalue, principal component analysis, and objective mapping.

Prerequisite: MAT 126 or MAT 132 or MAT 142 or MAT 171 or level 8 on the MPE

SBC: ESI
3 credits

ATM 345: Atmospheric Thermodynamics and Dynamics
A quantitative introduction to the thermodynamical and dynamical processes of Earth's atmosphere. Topics include moist and dry thermodynamical processes, hydrostatic stability, external forces of atmospheric motion, equations of atmospheric motions on a rotating planet, coordinate transformations, and horizontal motions under balanced forces.

Prerequisites: ATM 205; MAT 203 or MAT 205 or AMS 261; PHY 126/PHY 127 or PHY 132 or PHY 142; ATM 320 or CSE 130 or ESG 111 or PHY 277
3 credits

ATM 346: Advanced Atmospheric Dynamics
Advanced concepts of mid-latitude and tropical atmospheric motions, wave dynamics, and numerical methods. Topics include circulation and vorticity, turbulence and boundary-layer structure, quasi-geostrophic theory, large-scale and buoyancy-driven waves, baroclinic instability and energetics, equatorial wave theory, and barotropic and primitive equation models.

Prerequisites: ATM 345; MAT 303 or AMS 361
3 credits
### ATM 347: Advanced Synoptic Meteorology and Weather Forecasting

The application of dynamical and physical meteorology to the analysis and prediction of the atmosphere. Topics include application of numerical and statistical models, diagnosis of vertical motion, development of midlatitude synoptic systems, mesoscale phenomena associated with cyclones, convective systems, and radar applications. Laboratories include extensive practice in forecasting and diagnosis of synoptic and convective systems.

**Prerequisites:** ATM 346 and 348

**3 credits**

### ATM 348: Atmospheric Physics

The application of the laws of physics to a variety of atmospheric phenomena and processes. Topics include cloud and precipitation processes with emphasis on the microphysics, atmospheric electricity, solar and terrestrial radiation, photochemical processes, and boundary layer heat and mass transfer.

**Prerequisite:** ATM 345

**3 credits**

### ATM 365: Tropical Meteorology

The goal of this class is to provide a working knowledge of the dynamics and thermodynamics of the tropical atmosphere. A variety of tropical circulations and phenomena will be studied in detail, including regional and large-scale tropical circulations and their role in the global general circulation, tropical wave dynamics, convection and convective systems, synoptic, intraseasonal, and seasonal variability; monsoons, the El Niño/Southern Oscillation, tropical cyclones.

**Prerequisites:** ATM 345, ATM 346, ATM 348

**3 credits**

### ATM 383: Doppler Weather Radar

Designed to provide students with a working knowledge of Doppler weather radar, including: what the basic components of a weather radar are, a theoretical background of how radars operate, an in-depth understanding of the wide variety of weather radar applications used in atmospheric science careers, and an overview on the use of emerging radar technologies in new and updated Doppler weather radar systems. Students also will gain hands-on experience working with Doppler radar data and radar viewing and editing software.

**Corequisite:** ATM 345

**3 credits**

### ATM 397: Air Pollution and Its Control

A detailed introduction to the causes, effects, and control of air pollution. The pollutants discussed include carbon monoxide, sulfur oxides, nitrogen oxides, ozone, hydrocarbons, and particulate matter. The emissions of these gases from natural and industrial sources and the principles used for controlling the latter are described. The chemical and physical transformations of the pollutants in the atmosphere are investigated and the phenomena of urban smog and acid rain are discussed.

**Prerequisites:** ENS/PHY 119 or PHY 132/134 or 142, or PHY 126 and 127, or PHY 125 and 127; CHE 131 or 141 or 198; MAT 125 or 131 or 141 or AMS 151; U3 or U4 standing

**SBC:** CER

### ATM 437: Forecasting Practicum

The course provides students with additional forecasting experience. Students make at least three forecasts per week for either Long Island or a city designated by the National Forecast Contest. Students write a weather discussion for each forecast and verify their forecasts to show their progress during the semester.

**Pre- or Corequisite:** ATM 347

**1 credit**

### ATM 444: Experiential Learning

This course is designed for students who engage in a substantial, structured experiential learning activity in conjunction with another class. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a "real-world" setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, mentored research, field work, or an internship.

**Prerequisite:** WRT 102 or equivalent; permission of the instructor and SoMAS Undergraduate Programs Director

**SBC:** EXP+

**0-6 credits**

### ATM 447: Senior Tutorial in Atmospheric Sciences

Independent readings in advanced topics to be arranged prior to the beginning of the semester. Weekly conferences are held with a faculty member. May be repeated once.

**Prerequisite:** Permission of instructor and SoMAS Undergraduate Program Director

**SBC:** EXP+

**0-6 credits, S/U grading**