# **METEOROLOGY (METR)**

#### **METR 100 Weather and Climate**

**Prerequisites:** MATH 101 or higher; or a qualifying Math Placement Exam score for MATH 102 or 104 or higher

**Description:** Physical behavior of the atmosphere; elements of weather and climate and their distribution over the earth. Weather map analysis and forecasting. Atmospheric circulation, precipitation processes, severe weather, air pollution, and the use of weather radar. Concepts of weather forecasting.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Grading Option: Graded with Option Prerequisite for: GEOL 372; METR 153; METR 205; METR 270; METR 446 ACE: ACE 4 Science Course and Laboratory Fee: \$20

#### METR 140 Severe and Unusual Weather

**Prerequisites:** MATH 101 or higher; or a qualifying Math Placement Exam score for MATH 102 or 104 or higher.

Notes: Will not count toward the major in METR.

**Description:** Meteorological basics to help understand ice storms,

blizzards, tornadoes, hurricanes, flooding, droughts, and other unusual weather.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Prerequisite for: METR 270 ACE: ACE 4 Science

# METR 153 Introduction to Scientific Programming in Atmospheric Science

#### Prerequisites: METR 100

Notes: No prior programming experience is required.

**Description:** Introduction to problem solving with computers using MATLAB. Topics include language syntax, data types, program organization, problem-solving methods, and algorithm design and verification. Basics of problem solving with computers, and the skills necessary to analyze and visualize geophysical data sets.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 9 Grading Option: Graded Offered: SPRING Prerequisite for: METR 205; METR 223; METR 311; METR 323

#### METR 180 Climate Change, Energy, and the Environment

**Description:** Concepts and processes of the environment, energy, and climate change and how they are interrelated.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option ACE: ACE 4 Science

#### **METR 205 Introduction to Atmospheric Science**

Prerequisites: MATH 106; METR 100; PHYS 211 or 211H, METR 153 Description: Conceptual foundations for synoptic and dynamic meteorology. Meteorological data analysis, the dynamics of atmospheric motions, and atmospheric thermodynamics. Credit Hours: 4

Max credits per semester: 4 Max credits per degree: 4 Grading Option: Graded with Option Offered: FALL Prerequisite for: METR 223; METR 311; METR 323 Course and Laboratory Fee: \$20

#### **METR 223 Atmospheric Thermodynamics**

**Prerequisites:** METR 153; METR 205; MATH 107 or parallel. **Description:** Basic thermodynamic concepts relevant to atmospheric processes, atmospheric stability, and cloud and precipitation microphysics.

Credit Hours: 4

Max credits per semester: 4 Max credits per degree: 4 Grading Option: Graded with Option Prerequisite for: METR 341

# METR 270 Global warming: Science, Impacts, Solutions

**Prerequisites:** METR 100 or METR 140 or METR 180 **Description:** Examine climate change at the global, regional, and local scale. Develop an awareness of the human elements of climate change through an exploration of impacts, adaptations, and vulnerability to climate change. Climate change solutions from the local through global scale.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded Offered: FALL

METR 291 Special Topics in Meteorology-Climatology Description: Topics vary. Credit Hours: 1-6 Min credits per semester: 1 Max credits per semester: 6 Max credits per degree: 6 Grading Option: Graded with Option

# METR 296 Independent Study in Meteorology-Climatology

Prerequisites: Permission. Description: Independent reading or research under direction of a faculty member. Credit Hours: 1-3 Min credits per semester: 1 Max credits per semester: 3 Max credits per degree: 6 Grading Option: Graded with Option

#### METR 311 Dynamic Meteorology I

Prerequisites: METR 153; MATH 208/208H; METR 205; PHYS 211/211H Description: Equations of thermodynamics, momentum, and continuity are derived and applied to atmospheric motion. Energy conservation, flows, and conversions. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Prerequisite for: METR 312

#### METR 312 Dynamic Meteorology II

Prerequisites: METR 311; MATH 221/821.

**Description:** Applications of the principles of dynamic meteorology to the problems of forecasting and meteorological problems.

Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Offered: FALL/SPR

METR 323 Physical Meteorology Prerequisites: METR 153; METR 205; PHYS 212/212H Description: Physical principles that provide the foundation for meteorology. Absorption, scattering, and transmission of radiation in the atmosphere, atmospheric optics, atmospheric electricity, and lightning. Credit Hours: 4

Max credits per semester: 4 Max credits per degree: 4 Grading Option: Graded with Option Course and Laboratory Fee: \$20

#### METR 341 Synoptic Meteorology

Prerequisites: METR 223

**Description:** Dynamic and thermodynamic concepts and principles applied to synoptic-scale weather forecasting. Dynamics, energetics, structure, evolution, and motion of extra-tropical cyclones. Meteorological communications, interpretation and analysis of weather maps, and thermodynamic diagrams.

Credit Hours: 4

Max credits per semester: 4 Max credits per degree: 4 Grading Option: Graded with Option Course and Laboratory Fee: \$40

# METR 370 Applied Climatology

Crosslisted with: NRES 370

Prerequisites: Junior or Senior Standing

**Description:** Processes that give rise to spatial and temporal differences in climate. Various interrelationships between humans and climate. Influence of climate on building styles, the economy, water resources, human health, and society. Humans' inadvertent and purposeful modification of the atmosphere.

#### Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Offered: FALL Course and Laboratory Fee: \$20

#### **METR 408 Microclimate: The Biological Environment**

Crosslisted with: PLAS 408, GEOG 408, NRES 408, WATS 408, AGRO 808, GEOG 808, HORT 808, METR 808, NRES 808

**Prerequisites:** Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering. **Description:** Physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

Prerequisite for: BSEN 954, NRES 954

# METR 415 General Circulation of the Atmosphere

Crosslisted with: METR 815

Prerequisites: Junior standing; METR 475/875; PHYS 211/211H; and PHYS 221.

**Description:** Development of the atmospheric circulation regimes, from planetary scale (e.g., the planetary waves) to synoptic scale (e.g., the cyclones and anticyclones) and mesoscale, their seasonal variations, and their roles in horizontal vertical energy and water transport and budgets in the Earth system.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

# METR 421 Cloud Physics

Crosslisted with: METR 821

Prerequisites: METR 223 and METR 323 or equivalent

**Description:** Buoyancy and parcel mixing, cloud physics instrumentation, the role of aerosols in precipitation processes, growth of liquid cloud droplets/raindrops/ice crystals, processes associated with falling precipitation particles, drop size distributions and their moments, applications to convection, and parameterizations of cloud microphysical processes for numerical modeling applications. **Credit Hours:** 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

METR 433 Boundary-layer Meteorology

Crosslisted with: METR 833

**Prerequisites:** METR 223 and MATH 208/208H **Description:** Basic concepts of atmospheric turbulence and fundamental dynamics, thermodynamics, and structure of the atmospheric boundary layer are discussed. Atmospheric boundary layer parameterizations used in modern weather and climate models are presented.

Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Prerequisite for: METR 933

#### METR 442 Advanced Synoptic Meteorology-Climatology

# Crosslisted with: METR 842

Prerequisites: METR 341.

**Description:** Analysis and forecasting of subsynoptic-scale weather systems. Convection, thunderstorm models, severe local storm forecasting techniques, mesoscale convective complexes, vertical cross-sections, isentropic analysis, and weather radar.

Credit Hours: 4 Max credits per semester: 4 Max credits per degree: 4 Grading Option: Graded with Option Prerequisite for: METR 944 ACE: ACE 10 Integrated Product Course and Laboratory Fee: \$40 Experiential Learning: Research

#### METR 443 Severe Storms Meteorology-Climatology Crosslisted with: METR 843

Prerequisites: METR 311, METR 341 or parallel

**Description:** Dynamics of various types of severe weather (blizzards, flash floods, lightning, thunderstorms and winter and summer tornado outbreaks). Interpretation of the numerical and statistical models utilized to forecast these phenomena. Synoptic case studies of severe weather occurrences. Recent research on severe weather.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### METR 444 Mesoscale Meteorology

Crosslisted with: METR 844 Prerequisites: METR 311 Description: Dynamics and conceptual models of mesoscale meteorological phenomena and processes. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### METR 446 Broadcast Meteorology

Prerequisites: METR 100

**Notes:** Only 3 hours of credit from METR 446 or METR 497 may be applied to the major.

**Description:** Information about the history and current status of broadcast meteorology and related technology. Procedures and requirements to obtain Professional Society certification/seal in Broadcast Meteorology. Address on air requirements mandated by the Federal FCC rules and regulations and social impacts of broadcast meteorology. Opportunity to gain experience in presenting weather information through various media outlets, including the use of chromakey technology and social media.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### **METR 450 Climate and Society**

**Crosslisted with:** PLAS 450, GEOG 450, NRES 452, AGRO 850, GEOG 850, METR 850, NRES 852

Prerequisites: Junior standing or above.

Notes: Offered spring semester of even-numbered calendar years. Description: Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

Offered: SPRING

#### METR 453 GIS in Earth and Atmospheric Sciences

Crosslisted with: GEOL 453, GEOL 853, METR 853 Prerequisites: Junior or above standing; and one of the following: GEOL 100 or 101, or METR 100 Description: Basic concepts of GIS, hands-on experience with various case studies from geology, meteorology, climatology and environmental applications. Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded

#### METR 454 Statistical Analysis of Atmospheric Data Crosslisted with: METR 854

Prerequisites: 6 hrs METR and MATH 107/107H.

**Description:** Application of univariate statistics, hypothesis testing, statistical forecasting, forecast verification, time-series analysis, principal component analysis, and cluster/multivariate analysis to atmospheric data for different applications in the atmospheric sciences (from short-term weather forecast to long-term climate prediction).

Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Prerequisite for: METR 965

#### METR 463 Radar Meteorology

Crosslisted with: METR 863 Prerequisites: METR 323. Description: The fundamental principles of weather radars and the basic application of these principles. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Offered: SPRING Course and Laboratory Fee: Total Seats Needed: 150 Experiential Learning: Research

#### **METR 464 Satellite Meteorology**

Crosslisted with: METR 864 Prerequisites: METR 223 Description: Concepts and principles related to meteorological observations from satellites. Applications for weather analysis and forecasting. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Course and Laboratory Fee: \$20

#### **METR 469 Bio-Atmospheric Instrumentation**

Crosslisted with: GEOG 469, PLAS 407, AGST 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, AGST 869, NRES 869 Prerequisites: Junior standing; MATH 106; 4 hrs physics; physical or biological science major.

**Description:** Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### METR 470 The Climate System: Analysis and Prediction Crosslisted with: METR 870

**Prerequisites:** Senior standing; major or minor in meteorology. **Description:** Maintenance of the climate system and climate change over time. Global budgets of energy, water, and momentum and their balance. Development of simple, physically-based models of climate and of climate change.

Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option ACE: ACE 10 Integrated Product Experiential Learning: Research

#### METR 471 Tropical Meteorology

Crosslisted with: METR 871 Prerequisites: METR 223 and METR 311 Description: Atmospheric phenomena unique to the tropics, and their connection to the global circulation. Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### **METR 475 Physical Climatology**

Crosslisted with: METR 875

Prerequisites: METR 205.

**Description:** Global energy and water balance regimes of the earth and its atmosphere. Utilization of physical laws to reveal causes and effects of interrelationships in the climatic system.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option Prerequisite for: METR 415, METR 815; METR 483, METR 883, NRES 467, NRES 867

#### **METR 478 Regional Climatology**

Crosslisted with: METR 878, NRES 478, NRES 878 Prerequisites: NRES/METR 370. Description: Regional differentiation of the climates of the earth on both a descriptive and dynamic basis. The chief systems of climatic classification. Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### **METR 479 Hydroclimatology**

Crosslisted with: NRES 479, WATS 479, BSEN 479, NRES 879, METR 879, BSEN 879

Prerequisites: NRES 208 or METR 100 or METR/NRES 370. Notes: Offered spring semester of even-numbered calendar years. Description: Interaction between earth's climate and the hydrologic cycle. Energy and water fluxes at the land-atmosphere interface. Atmospheric moisture transport, precipitation, evaporation, snowmelt, and runoff. Impacts of climate variability and change on the hydrologic cycle. Credit Hours: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### METR 483 Global Climate Change

Crosslisted with: METR 883, NRES 467, NRES 867

Prerequisites: Junior standing; and METR 475/875. Notes: Offered fall semester of even-numbered calendar years. Description: Elements of climate systems, El Nino/LaNina cycle and monsoons, natural variability of climate on interannual and interdecadal scales. Paleoclimate, and future climate, developed climate change scenarios and climate change impacts on natural resources and the environment.

Credit Hours: 3 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

# METR 487 Earth's Climate: Past, Present, Future

Crosslisted with: METR 887

Prerequisites: 6 hrs METR or 6 hrs GEOL.

**Description:** How the Earth's climate has varied and the forcing mechanisms related to those changes. Themes that reappear through Earth's climate history and into the future; causes of climate change; the natural response times of the multiple components; and the role of greenhouse gases within the climate system at differing time scales. **Credit Hours**: 3

Max credits per semester: 3 Max credits per degree: 3 Grading Option: Graded with Option

#### METR 491 Special Topics in Meteorology-Climatology

Crosslisted with: METR 891 Description: Topics vary. Credit Hours: 1-6 Min credits per semester: 1 Max credits per semester: 6 Max credits per degree: 8 Grading Option: Graded with Option

METR 495 Internship in Meteorology-Climatology Crosslisted with: METR 895

Prerequisites: Permission.

Description: Application of meteorology-climatology learning with on-thejob training. Credit Hours: 1-6

Min credits per semester: 1

Max credits per semester: 6

Max credits per degree: 6

Grading Option: Pass No Pass

### METR 496 Independent Study in Meteorology-Climatology

Prerequisites: Permission.

**Description:** Independent reading or research under direction of a faculty member.

Credit Hours: 1-3 Min credits per semester: 1 Max credits per semester: 3 Max credits per degree: 6 Grading Option: Graded with Option

## METR 497 Broadcast Meteorology Practicum

Prerequisites: Permission.

**Notes:** Only 3 hours from METR 446 or METR 497 may be applied to the major.

**Description:** Produce weather presentations worthy of airing live during Star City News. Learn how to develop weather presentations for production, including development of graphics, lead ins and promos. Oneon-one critiquing/coaching to improve the presentation and content of the presentation will also take place throughout the semester.

Credit Hours: 1-3 Min credits per semester: 1 Max credits per semester: 3 Max credits per degree: 3 Grading Option: Pass No Pass

#### METR 499 Undergraduate Thesis

Prerequisites: Permission. Description: Independent research leading to a thesis. Credit Hours: 1-3 Min credits per semester: 1 Max credits per semester: 3 Max credits per degree: 6 Grading Option: Graded with Option

## METR 499H Honors Undergraduate Thesis

Prerequisites: Permission. Description: Independent research leading to a thesis. Credit Hours: 1-3 Min credits per semester: 1 Max credits per semester: 3 Max credits per degree: 6 Grading Option: Graded with Option