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
ACE: ACE 4 Science
Course and Laboratory Fee: $20

METR 101 Pathways to Success in Meteorology-Climatology
Prerequisites: Freshman standing or permission of the instructor.
Description: Exploration of careers in atmospheric science and discussions of atmospheric science subdisciplines and their applications. Departmental and professional resources to help develop pathways to success in atmospheric science.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Pass No Pass
Offered: FALL

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 micro-physics.
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: Develop an awareness of the human dimensions of climate change by investigating its impacts, adaptations, and solutions at local, regional, and global scales. Examine how vulnerability to climate change is shaped by socio-economic, cultural, and geographical factors.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL
ACE: ACE 9 Global/Diversity

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

METR 408 Microclimate: The Biological Environment
Crosslisted with: PLAS 408, GEOG 408, NRES 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 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 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: $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 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, 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-the-job 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
Experiential Learning: Internship/Co-op

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 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. Credit toward the degree cannot be earned in both METR 499 and METR 499H.
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