Atmospheric Science (ATM_SC)

ATM_SC 1050: Introductory Meteorology
(same as GEOG 1050). Physical processes of atmosphere in relation to day-to-day changes in weather.

Credit Hours: 3

ATM_SC 1050H: Introductory Meteorology - Honors
(same as GEOG 1050H). Physical processes of atmosphere in relation to day-to-day changes in weather.

Credit Hours: 3
Prerequisites: Honors eligibility required

ATM_SC 1060: Introductory Meteorology Laboratory
This 1-credit laboratory course is an optional component of ATM_SC 1050 (Introductory Meteorology), used to satisfy a physical science with laboratory credit. This laboratory course is designed to improve the understanding of basic meteorological principles by map analysis and various other laboratory components. Graded on A-F basis only.

Credit Hour: 1
Prerequisites or Corequisites: GEOG 1050 or ATM_SC 1050

ATM_SC 2022: Severe and Hazardous Weather
This course focuses on the most extreme weather events in the United States (primarily in the central plains and Midwest). Students will learn introductory-level atmospheric processes that control the weather, and how these processes create severe weather (i.e., thunderstorms, hail, lightning, tornadoes, ice storms, floods, droughts, etc.). A thorough review of severe weather safety and mitigation will also be explored. Graded on A-F basis only.

Credit Hours: 3

ATM_SC 2150: Natural Hazards
A survey of natural hazards, including severe thunderstorms, tornadoes, flooding, tropical storms, ocean movements, earthquakes, tsunamis, volcanoes, asteroids, solar weather, managing risk and human impacts. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: ATM_SC 1050 or equivalent, or instructor's consent

ATM_SC 2720: Weather Briefing
Student participation in daily discussions of current weather patterns and forecasts and their applications to weather sensitive activities including aviation, agriculture and industry.

Credit Hours: 2
Prerequisites: ATM_SC 1050

ATM_SC 2792: Weather Observation
Methods of surface and upper air weather observation. How such data are distributed to users in the meteorological community is also addressed.

Credit Hour: 1
Prerequisites: ATM_SC 1050; sophomore standing

ATM_SC 3000: Independent Study in Atmospheric Science
Independent study of a topic dealing with meteorological theory or application of meteorological science to the solution of relevant problem.

Credit Hour: 1-3
Prerequisites: ATM_SC 1050
Recommended: Upper level standing

ATM_SC 3600: Climates of the World
(same as GEOG 3600). A study of the world distribution of climates based on "cause and effect" relationships. Special attention is given to the impacts of climate on humanity.

Credit Hours: 3
Prerequisites: MATH 1100

ATM_SC 4001: Topics in Atmospheric Science
Development of theory and applications for selected topics in atmospheric science.

Credit Hour: 1-99
Prerequisites: junior standing and instructor's consent

ATM_SC 4110: Broadcast Meteorology I
An introduction to broadcast meteorology including the business of media, use of meteorological data to produce a forecast, and television and radio presentation skills. Graded on A-F basis only.

Credit Hours: 2
Prerequisites: ATM_SC 1050, ATM_SC 2720, or equivalents

ATM_SC 4210: Broadcast Meteorology II
Instruction and methods for creating meaningful television weather graphics (and forecasts) using the MAX Weather System. Students will also practice delivering weathercasts on-air and on social media utilizing current television production equipment. Students will also learn how to deliver weathercasts on air (and on social media), deal with breaking weather situations, as well as expand upon severe weather communication and basic television presentation skills. Graded on A-F basis only.

Credit Hours: 2
Prerequisites: ATM_SC 4110
Recommended: ATM_SC 4710

ATM_SC 4310: Atmospheric Thermodynamics
(cross-leveled with ATM_SC 7310). Thermodynamics of dry and moist air, atmospheric hydrostatics, convection, and development of the fundamental equations of geophysical fluid dynamics.

Credit Hours: 4
Prerequisites: ATM_SC 1050, MATH 1700 (C or better), and one physics course

ATM_SC 4320: Atmospheric Dynamics
(cross-leveled with ATM_SC 7320). Dynamics and kinematics of atmospheric flow. Manipulation of fundamental equations, numerical modeling of atmosphere.

Credit Hours: 4
Prerequisites: ATM_SC 4310 or ATM_SC 7310

ATM_SC 4350: Mesoscale Meteorology and Dynamics
(cross-leveled with ATM_SC 7350). Survey of mesoscale phenomena, observing systems, analysis techniques, and modeling. Topics include fronts, jet streaks, gravity waves, organized convection, tornadoes, and severe local storm forecasting and structure.

Credit Hours: 3
Prerequisites: ATM_SC 1050 and MATH 1500
Recommended: ATM_SC 4710, ATM_SC 4590

ATM_SC 4400: Microclimatology
(cross-leveled with ATM_SC 7400). Application of physical principles to explain the role of the atmosphere in environmental science, geography, agriculture, forestry, ecology, engineering, and planning. Data from real-world examples will be analyzed, visualized, and interpreted. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: MATH 1500, CHEM 1320

ATM_SC 4510: Remote Sensing for Meteorology and Natural Resources
(cross-leveled with ATM_SC 7510). Principles of remote sensing with emphasis on the properties of atmosphere and the earth's surface from airborne and satellite sensors. The techniques for using geosynchronous and orbiting satellite platforms for assessing weather and natural resource features.

Credit Hours: 3
Prerequisites: ATM_SC 1050, MATH 1500, junior standing or instructor's consent

ATM_SC 4520: Environmental Biophysics
(same as GEOG 4520; cross-leveled with ATM_SC 7520, GEOG 7520). Students will learn techniques and principles used to describe the microenvironment of living organisms and use quantitative expressions to estimate missing values, and mass transfer laws to estimate flux of energy, water and gas.

Credit Hours: 3
Prerequisites: College Physics and Calculus I

ATM_SC 4550: Physical Meteorology
(cross-leveled with ATM_SC 7550). Physics of atmospheric nucleation-condensation, cloud droplet and precipitation formation, associated electrical phenomena, radiation transfer and remote sensing.

Credit Hours: 3
Prerequisites: CHEM 1320, MATH 1500

ATM_SC 4590: Radar Meteorology
(cross-leveled with ATM_SC 7590). Course concerns the theory and application of radar in meteorology. May be repeated for credit.

Credit Hours: 3
Prerequisites: ATM_SC 1050, MATH 1500
Recommended: PHYSCS 2750, MATH 1700

ATM_SC 4650: Long-Range Forecasting
(cross-leveled with ATM_SC 7650). Physical-dynamical principles of long-range forecasting from a month to a year. Empirical and numerical approaches in forecast practice.

Credit Hours: 3
Prerequisites: ATM_SC 4050 or ATM_SC 7050 or ATM_SC 3600

ATM_SC 4710: Synoptic Meteorology I
(cross-leveled with ATM_SC 7710). Meteorological Data. Basic techniques for surface and upper air analysis, using selected examples of weather patterns.

Credit Hours: 4
Prerequisites: ATM_SC 1050, MATH 1700 (C or better)
Recommended: one physics course

ATM_SC 4720: Synoptic Meteorology II
(cross-leveled with ATM_SC 7720). Graphical analysis and interpretation of physical, kinematical and dynamical properties of the atmosphere. Analysis techniques applicable to atmospheric research.

Credit Hours: 4
Prerequisites: ATM_SC 4710 or ATM_SC 7710

ATM_SC 4720W: Synoptic Meteorology II - Writing Intensive
(cross-leveled with ATM_SC 7720). Graphical analysis and interpretation of physical, kinematical and dynamical properties of the atmosphere. Analysis techniques applicable to atmospheric research.

Credit Hours: 4
Prerequisites: ATM_SC 4710 or ATM_SC 7710

ATM_SC 4730: Advanced Forecasting Laboratory
Advanced principles of weather forecasting will be addressed via online electronic modules and weekly laboratory exercises. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: ATM_SC 4720

ATM_SC 4800: Numerical Methods in Atmospheric Science and Natural Resources
(cross-leveled with ATM_SC 7800). Examines numerical methods used in solving differential equations, filtering data sets, and Fourier decomposition of discrete data sets.

Credit Hours: 3
Prerequisites: senior standing
Recommended: Math through Calculus III

ATM_SC 4945: Experiential Learning in Industry Internship in Atmospheric Science
Learning experience combining observation, application, and reflection in a discipline-based industry internship. Course appears on transcript for zero credit and does not count toward full-time enrollment. No tuition or fees are charged. Graded on S/U basis only.

Credit Hours: 0
Prerequisites: instructor's consent

ATM_SC 4949: Internship in Meteorology
Practical professional work experience with professional or scientific meteorologists in off-campus work environment. Graded on S/U basis only.

Credit Hour: 1-6
Prerequisites: sophomore standing or the permission of the Instructor

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ATM_SC 4950: Undergraduate Research in Atmospheric Science
Research apprenticeship with a faculty mentor. Students are expected to develop initial concept for the research, design experiments, collect data, and analyze data with faculty input, oversight, and guidance.

Credit Hour: 1-4
Prerequisites: STAT 1400, MATH 1500
Recommended: 10 hours of Atmospheric Science courses

ATM_SC 4955: Experiential Learning in Research in Atmospheric Science
A supervised learning experience contributing to faculty research. Course appears on transcript for zero credit and does not count toward full-time enrollment. No tuition or fees are charged. Graded on S/U basis only.

Credit Hours: 0
Prerequisites: instructor's consent

ATM_SC 4980: Introduction to Atmospheric Simulations
(cross-leveled with ATM_SC 7980). Students will be instructed in the design and implementation of numerical weather prediction systems. After initial exposure to the concepts of map projections, finite differencing, objective analysis, initialization, and lateral boundary conditions, discretized solution of the partial differential equations (PDEs) that represent the atmosphere will be studied. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: MATH 2300 or ATM_SC 4720, or instructor's consent

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ATM_SC 7310: Atmospheric Thermodynamics
(cross-leveled with ATM_SC 4310). Thermodynamics of dry and moist air, atmospheric hydrostatics, convection, and development of the fundamental equations of geophysical fluid dynamics.

Credit Hours: 4
Prerequisites: ATM_SC 1050, MATH 1700 (C or better), and one physics course

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ATM_SC 7320: Atmospheric Dynamics
(cross-leveled with ATM_SC 4320). Dynamics and kinematics of atmospheric flow. Manipulation of fundamental equations, numerical modeling of atmosphere.

Credit Hours: 4
Prerequisites: ATM_SC 4310 or ATM_SC 7310

ATM_SC 7350: Mesoscale Meteorology and Dynamics
(cross-leveled with ATM_SC 4350). Survey of mesoscale phenomena, observing systems, analysis techniques, and modeling. Topics include fronts, jet streaks, gravity waves, organized convection, tornadoes, and severe local storm forecasting and structure. Prerequisites:

Credit Hours: 3
Prerequisites: ATM_SC 1050 and MATH 1500
Recommended: ATM_SC 4710, ATM_SC 4590

ATM_SC 7400: Microclimatology
(cross-leveled with ATM_SC 4400). Application of physical principles to explain the role of the atmosphere in environmental science, geography, agriculture, forestry, ecology, engineering, and planning. Data from real-world examples will be analyzed, visualized, and interpreted. Graded on A-F only.

Credit Hours: 3
Prerequisites: MATH 1500, CHEM 1320, senior standing and instructor's consent

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ATM_SC 7510: Remote Sensing for Meteorology and Natural Resources
(cross-leveled with ATM_SC 4510). Principles of remote sensing with emphasis on the properties of atmosphere and the earth's surface from airborne and satellite sensors. The techniques for using geosynchronous and orbiting satellite platforms for assessing weather and natural resource features. Graduate student credit is dependent upon completion of additional advanced research assignments. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: ATM_SC 1050, MATH 1500, junior standing or instructor's consent

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ATM_SC 7520: Environmental Biophysics
(same as GEOG 7520; cross-leveled with ATM_SC 4520, GEOG 4520). Students will learn techniques and principles used to describe the microenvironment of living organisms and use quantitative expressions to estimate missing values, and mass transfer laws to estimate flux of energy, water, and gas.

Credit Hours: 3
Prerequisites: college physics, calculus I

ATM_SC 7550: Physical Meteorology
(cross-leveled with ATM_SC 4550). Physics of atmospheric nucleation-condensation, cloud droplet and precipitation formation, associated electrical phenomena, radiation transfer and remote sensing.

Credit Hours: 3
Prerequisites: CHEM 1320, MATH 1500

ATM_SC 7590: Radar Meteorology
(cross-leveled with ATM_SC 4590). Course concerns the theory and application of radar in meteorology. Graduate students will be required to conduct an independent research project using radar, in addition to the undergraduate requirements for the class. May be repeated for credit.

Credit Hours: 3
Prerequisites: ATM_SC 1050, MATH 1500
Recommended: PHYSCS 2750, MATH 1700

ATM_SC 7650: Long-Range Forecasting
(cross-leveled with ATM_SC 4650). Physical-dynamical principles of long-range forecasting from a month to a year. Empirical and numerical approaches in forecast practice.

Credit Hours: 3
Prerequisites: ATM_SC 4050 or ATM_SC 7050 or ATM_SC 3600

ATM_SC 7710: Synoptic Meteorology I
(cross-leveled with ATM_SC 4710). Meteorological Data. Basic techniques for surface and upper air analysis, using selected examples of weather patterns.

Credit Hours: 4
Prerequisites or Corequisites: one physics course
Prerequisites: ATM_SC 1050, MATH 1700 (C or better)

ATM_SC 7720: Synoptic Meteorology II
(cross-leveled with ATM_SC 4720). Graphical analysis and interpretation of physical, kinematical and dynamical properties of the atmosphere. Analysis techniques applicable to atmospheric research.

Credit Hours: 4
Prerequisites: ATM_SC 4710 or ATM_SC 7710

ATM_SC 7800: Numerical Methods in Atmospheric Science and Natural Resources
(cross-leveled with ATM_SC 4800). Examines numerical methods used in solving differential equations, filtering data sets, and Fourier decomposition of discrete data sets.

Credit Hours: 3
Prerequisites: Math through Calculus III

ATM_SC 7980: Introduction to Atmospheric Simulations
(cross-leveled with ATM_SC 4980). Students will be instructed in the design and implementation of numerical weather prediction systems. After initial exposure to the concepts of map projections, finite differencing, objective analysis, initialization, and lateral boundary conditions, discretized solution of the partial differential equations (PDEs) that represent the atmosphere will be studied. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: MATH 2300, ATM_SC 4720, or instructor's consent required

ATM_SC 8001: Topics in Atmospheric Science
Development of the theory with its application for selected topics in atmospheric science.

Credit Hours: 3

ATM_SC 8085: Problems in Atmospheric Science
Independent study by graduate students in atmospheric science.

Credit Hour: 1-99

ATM_SC 8090: Masters Research in Atmospheric Science
Original investigation in atmospheric science in support of a master's thesis. Graded on S/U basis only.

Credit Hour: 1-99

ATM_SC 8200: Meteorological Statistics
Applies theory of probability and frequency distribution to meteorological variables.

Credit Hours: 3
Prerequisites: ATM_SC 4050 or ATM_SC 7050 or STAT 4710 or instructor's consent

ATM_SC 8400: Atmospheric General Circulation
Comprehensive review of dynamical theories of general circulation with intensive discussion of current problems.

Credit Hours: 3
Prerequisites: ATM_SC 4320 or ATM_SC 7320

ATM_SC 8450: Tropical Meteorology
Study of the synoptic and dynamic character of the atmosphere in the tropical regions, including an examination of the general circulation and tropical storms.

Credit Hours: 3
Prerequisites: ATM_SC 4710 or ATM_SC 7710, ATM_SC 4720 or ATM_SC 7720 and MATH 2300; instructor's consent. Graded on A-F basis only

ATM_SC 8500: Radiation in the Atmosphere
Physics of solar and infrared radiative transfer in the atmosphere, including energy conversion effects, atmospheric optics, and photochemical processes.

Credit Hours: 3
Prerequisites: one year College Physics and MATH 1700

ATM_SC 8550: Nowcasting
Students will learn the science of nowcasting through the study of the various methods used and apply their knowledge in the design of the elements of a nowcast system and practical nowcasting exercises.

Credit Hours: 3
Prerequisites: ATM_SC 8500, instructor's consent

ATM_SC 8585: Rain
Students will learn about the properties of rain and its role in the atmosphere, hydrology, and surface processes using a combination of lectures, readings and study of rainfall data from multiple sources. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Graduate standing or instructor's consent
Recommended: ATM_SC 4550; ATM_SC 4590; MATH 1700

ATM_SC 8600: Advanced Climate Dynamics
Study of global climate; application of large scale atmospheric dynamics; conservation of various forms of energy, climatic evaluation, large scale climatic modification.

Credit Hours: 3
Prerequisites: ATM_SC 4320 or ATM_SC 7320 and ATM_SC 8400 or ATM_SC 3600

ATM_SC 9085: Problems in Atmospheric Science
Independent study by graduate students in atmospheric science.

Credit Hour: 1-99

ATM_SC 9087: Seminar in Atmospheric Science
Seminar in Atmospheric Science.

Credit Hour: 1-99

ATM_SC 9090: Doctoral Research in Atmospheric Science
Original investigation in atmospheric science in support of a doctoral dissertation. Graded on S/U basis only.

Credit Hour: 1-99

ATM_SC 9300: Introduction to Chaos Theory
Atmospheric predictability and related topics are examined as they relate to governing equations of motion and their non-linear solutions.

Credit Hours: 3
Prerequisites: ATM_SC 4320 or ATM_SC 7320, MATH 4100

ATM_SC 9350: Advanced Dynamic Meteorology
Application of perturbation dynamics, advanced dynamics, and numerical methods to study of atmospheric circulations.

Credit Hours: 3
Prerequisites: ATM_SC 4320 or ATM_SC 7320

ATM_SC 9590: Advanced Applications of Weather Radar
This course will investigate quantitative uses of weather radar data that go beyond standard reflectivity and velocity image interpretation, particularly those that use new techniques such as dual-polarization. Students will develop methods to analyze and display meteorological radar data. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Instructor's consent
Recommended: MATH 1700, PHYSCS 2760, INFOTC 1040 or equivalent, ATM_SC 4590

ATM_SC 9700: Advanced Synoptic Meteorology
Detailed examination of vertical motions, their forcing, and how each is diagnosed (quasigeostrophic theory, the Trenberth approximation, Q-vectors). Current issues in synoptic meteorology and operational forecasting are discussed.

Credit Hours: 3
Prerequisites: ATM_SC 4720 or ATM_SC 7720

ATM_SC 9712: Convection and Lightning
Cumulus convection and cloud physics topics that will facilitate a deeper understanding of cloud electrification and lightning production are studied. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: ATM_SC 4710 or ATM_SC 7710, ATM_SC 4720 or ATM_SC 7720, MATH 2300; instructor's consent

ATM_SC 9800: Numerical Weather Prediction
Examination of finite difference and objective analysis techniques, basic physical concepts, and parameterization of physical processes. Experience with a range of models (1-D cloud to operational PE models) stressed.

Credit Hours: 3
Prerequisites: instructor's consent