

Weather (WEAX)

WEAX 201 Introduction to Meteorology 3 Credits (3,0)

Foundational course on the governing principles of the atmosphere. Structure and composition; climate; energy and temperature; clouds and precipitation; wind and weather phenomena at various scales; meteorological data and products.

Course Offered at: Daytona Beach, Prescott, Worldwide, Asia

WEAX 203L Survey of Meteorology Laboratory 1 Credit (0,1)

Laboratory methods and techniques for meteorological data analysis, measurements, and working with weather charts. Complements WEAX 201, Introduction to Meteorology.

Course Offered at: Daytona Beach, Prescott

WEAX 261 Applied Climatology 3 Credits (3,0)

In-depth survey of world climates and their impact on aviation. Topics include energy exchange, seasonal variations, climate variability, and tools to understand past and future climate change.

Prerequisites: WEAX 201

Course Offered at: Daytona Beach, Prescott

WEAX 270 Weather Information Systems 3 Credits (3,0)

Introduction to weather-sensing instruments and systems for delivering weather information. Measurement principles, limitations, and application of data in operations and forecasting.

Prerequisites: WEAX 201

Course Offered at: Prescott

WEAX 272 Meteorological Instruments and Data Analysis 3 Credits (3,0)

Introduction to weather-sensing equipment, systems to analyze weather data, and data analysis techniques. Current instrumentation technology; physical principles used in weather measurements; limitations of measurements; use of data in operations and forecasting; visual and computational analysis of meteorological data, and plotting of meteorological fields.

Prerequisites: WEAX 201 and (CPSC 118 or ENGR 115)

Course Offered at: Daytona Beach

WEAX 280 Introduction to Broadcast Meteorology 3 Credits (1,2)

Techniques for communicating weather information via television, internet, social media, and live audiences. Focus on weather forecasting, public speaking, and media performance.

Prerequisites: WEAX 201

Course Offered at: Daytona Beach

WEAX 299 Special Topics in Meteorology 1-6 Credit (1-6,0)

Individual, independent, or directed studies of selected topics in meteorology.

Course Offered at: Daytona Beach, Prescott, Worldwide

WEAX 301 Aviation Weather 3 Credits (3,0)

Strategies for evaluating and anticipating aviation weather hazards and mitigating their associated risks. Icing, turbulence, wind shear, thunderstorms, clouds, fog, winter weather, volcanic ash; altimetry; application of meteorological products and online resources for flight planning.

Prerequisites: WEAX 201

Course Offered at: Daytona Beach, Prescott, Worldwide, Asia

WEAX 305 Weather Support Operations 3 Credits (3,0)

Application of weather information to support specific operations such as air races, auto races, or space launches. Interpretation of weather charts, radar, satellite data, and hazard assessment.

Prerequisites: WEAX 301

Course Offered at: Daytona Beach

WEAX 312 Mountain Meteorology 3 Credits (3,0)

Exploration of the atmospheric response to terrain influences at a variety of scales. Qualitative descriptions of physical and dynamical processes. Flow over terrain, including mountain waves, katabatic wind and downslope windstorms. Blocked flows, including barrier jets, cold-air surges, gap winds and lee vortices. Thermally forced circulations. Orographic convection and precipitation. Observational challenges and nowcasting techniques in complex terrain.

Prerequisites: WEAX 201

Course Offered at: Prescott

WEAX 321 Atmospheric Environmental Studies 3 Credits (3,0)

Overview of atmospheric topics related to local, regional, and global pollution issues. Focus on aerospace industry pollution, monitoring, and regulation.

Prerequisites: Sophomore standing

Course Offered at: Prescott

WEAX 322 Space Weather 3 Credits (3,0)

Introduction to the Sun-Earth relationship and societal impacts of space weather. Study of solar radiation, solar wind, and their effects on communications, satellites, and climate.

Course Offered at: Prescott, Worldwide

WEAX 325 General Meteorology 3 Credits (3,0)

Topics include state variables, atmospheric motions, energy transfer, Sun-Earth geometry, water vapor, and thermodynamic stability.

Prerequisites: CHEM 110 and MATH 241 and WEAX 201

Course Offered at: Daytona Beach

WEAX 327 Introduction to Weather Analysis and Forecasting 3 Credits (3,0)

Techniques for analyzing weather data, including METAR, radiosondes, surface and upper-air charts, satellite imagery, and radar. Focus on forecasting temperature and precipitation.

Daytona Beach Prerequisites: WEAX 301 or WEAX 325

Worldwide Prerequisites: WEAX 301

Course Offered at: Daytona Beach, Worldwide

WEAX 340 Severe Weather Field Forecasting 3 Credits (1,2)

Real-time forecasting and observation of severe thunderstorms. Visual storm cues, forecasting tools, and safety protocols in storm environments.

Course Offered at: Daytona Beach

WEAX 353 Thermodynamics of the Atmosphere 3 Credits (3,0)

Qualitative and quantitative analysis of meteorological conventions, heat/energy transfer, boundary layer structure and fluxes, moisture, stability, cloud formation, and precipitation processes.

Prerequisites: WEAX 201

Course Offered at: Prescott

WEAX 354 Dynamics of the Atmosphere 3 Credits (3,0)

Analysis of dynamic processes governing atmospheric motions. Qualitative and quantitative treatment of atmospheric forces, the equations of motion, local and global winds, air masses and fronts, mid-latitude cyclones, numerical weather prediction, thunderstorms, and hurricanes.

Prerequisites: WEAX 201 and WEAX 353

Course Offered at: Prescott

WEAX 360 Hurricanes and Tropical Meteorology 3 Credits (3,0)

Climatology of the tropical atmosphere; annual global climatological distribution of hurricanes; hurricane structure; atmospheric conditions (un)favorable for hurricane formation and intensification; instruments and platforms used to observe hurricanes; intensity estimation techniques; track and intensity forecasting techniques; current forecasting challenges.

Prerequisites: (WEAX 301 or WEAX 325) and (PHYS 113 or PHYS 150 or PHYS 226)

Course Offered at: Daytona Beach

WEAX 361 Global Climate Change 3 Credits (3,0)

Examination of global climate change dynamics, including historical and contemporary influences, future predictions, and mitigation strategies.

Prerequisites: WEAX 201

Course Offered at: Daytona Beach

WEAX 363 Thunderstorms 3 Credits (3,0)

Synthesis of stability, moisture, vertical shear, and other environmental factors on thunderstorm development and associated hazards. Qualitative descriptions of the storm dynamics that influence the initiation, organization, propagation, and severity of storms and convective systems. Practical thunderstorm analysis and forecasting using soundings, weather charts, and remote sensing imagery.

Daytona Beach Prerequisites: WEAX 301

Prescott Prerequisites: WEAX 301

Worldwide Prerequisites: WEAX 201

Course Offered at: Daytona Beach, Prescott, Worldwide

WEAX 364 Weather for Aircrews 3 Credits (3,0)

Global weather data collection and analysis for aircrews. Emphasis on airborne radar use, aviation weather charts, and identifying global weather hazards.

Prerequisites: WEAX 301

Course Offered at: Prescott

WEAX 365 Satellite and Radar Weather Interpretation 3 Credits (3,0)

Practical introduction to meteorological interpretation of satellite and weather radar imagery. Basic physics of electromagnetic (EM) radiation and radiation laws. How various wavelengths of the EM spectrum are used in satellite and radar remote sensing to create images of geophysical information. Real-time satellite identification of meteorological phenomena, including mountain waves, cyclones, fronts, jet streams, troughs, ridges, cloud types, fog, and thunderstorms. Radar reflectivity signatures of severe weather, calculation of rain rate, Doppler velocity interpretation, and recognizing clear-air-radar echoes. Descriptions of how remote sensing imagery can be misinterpreted.

Prerequisites: WEAX 301 or WEAX 325

Course Offered at: Daytona Beach, Prescott

WEAX 367 Thermodynamic Meteorology 3 Credits (3,0)

Study of thermodynamic processes in the atmosphere using calculus and physics. Topics include the Ideal Gas Law, energy conservation, and stability.

Prerequisites: CHEM 110 and PHYS 150

Course Offered at: Daytona Beach

WEAX 368 Physical Meteorology 3 Credits (3,0)

Study of radiative transfer, cloud microphysics, precipitation formation, and electrical phenomena within the atmosphere.

Prerequisites: MATH 242 and WEAX 367

Course Offered at: Daytona Beach

WEAX 374 Dynamic Meteorology I 3 Credits (3,0)

Calculus-based treatment of atmospheric dynamics; development of the momentum equation; geostrophic balance and the geostrophic wind; hydrostatic balance; gradient balance and the gradient wind; thermal wind balance.

Prerequisites: MATH 243 and WEAX 367

Course Offered at: Daytona Beach

WEAX 375 Dynamic Meteorology II 3 Credits (3,0)

The full set of equations governing atmospheric motion; kinematics; absolute vorticity equation; Rossby waves; cyclogenesis.

Prerequisites: PHYS 160 and WEAX 374

Course Offered at: Daytona Beach

WEAX 378 Synoptic Analysis and Forecasting 3 Credits (2,1)

Analysis and forecast tools and techniques for synoptic-scale weather phenomena, including mid-latitude cyclones, baroclinicity, jet streams, as well as temperature and precipitation diagnoses.

Prerequisites: WEAX 327 and WEAX 368 and WEAX 374

Course Offered at: Daytona Beach

WEAX 380 Advanced Broadcast Meteorology 3 Credits (1,2)

Advanced communication techniques for weather reporting, severe weather coverage, and professional broadcasting standards.

Prerequisites: (WEAX 280 and WEAX 327) or instructor permission

Course Offered at: Daytona Beach

WEAX 381 Climate Dynamics 3 Credits (3,0)

Quantitative introduction to climate variability, climate change processes, atmosphere-ocean interactions, and climate modeling.

Prerequisites: WEAX 368 and WEAX 375

Course Offered at: Daytona Beach

WEAX 390 Atmospheric Physics 3 Credits (3,0)

Quantitative overview of physical principles applied to the atmosphere, including elements of Earth-Sun geometry, gravitation, atmospheric structure, turbulence, waves, electromagnetic radiation, photochemistry, remote sensing, and atmospheric electricity.

Prerequisites: CPSC 118 and MATH 243 and WEAX 353

Course Offered at: Prescott

WEAX 399 Special Topics in Meteorology 1-6 Credit (1-6,0)

Individual, independent, or directed studies of selected topics in meteorology.

Course Offered at: Daytona Beach, Prescott, Worldwide

WEAX 410 Weather for Commercial Air Transport 3 Credits (3,0)

Application of worldwide weather data to decision-making for commercial aviation. Topics include short-range and long-range forecasts, airborne radar, satellite interpretation, ground icing, space weather, volcanic ash, and transoceanic flight planning.

Prerequisites: WEAX 301

Course Offered at: Daytona Beach

WEAX 420 Advanced Atmospheric Thermodynamics 3 Credits (3,0)

Application of physics and calculus to the study of atmospheric thermodynamics. The course covers such topics as hydrostatics, conservation of energy, the ideal Gas Law, temperature relationship to kinetic energy, specific heat, Enthalpy and Entropy. Topics include water and its transformations, the thermodynamics of dry, moist, and saturated air, and thermodynamic diagrams.

Prerequisites: CPSC 118

Course Offered at: Prescott

WEAX 422 Meteorological Statistics and Data Analysis 3 Credits (3,0)

Statistical and data analysis techniques applied to meteorological data. Topics include probability distributions, regression analysis, model output statistics, ensemble forecasts, and forecast verification metrics.

Prerequisites: WEAX 272 and WEAX 378

Course Offered at: Daytona Beach

WEAX 427 Forecasting Techniques 3 Credits (3,0)

Traditional forecasting methods combined with state-of-the art numerical weather prediction models applied to practical weather prognostication for a variety of weather phenomena at various spatial and temporal scales. Analysis techniques, forecast model construction, statistical tools, and forecast verification. Regular forecasting exercises with a focus on effective communication techniques.

Prerequisites: WEAX 363 and WEAX 365 and WEAX 492

Course Offered at: Prescott

WEAX 458 All Hazards Support, Modeling and Mapping 3 Credits (3,0)

Exploration of various hazard models utilized by incident meteorologists and emergency responders to simulate wildfire spread and behavior, floods, storm surges, and atmospheric dispersion. Utilizes geographic information systems to create hazard maps and communicate the impacts of hazard events in terms of geographical extent, severity of damage, and potential effects on populations and infrastructure.

Prerequisites: CPSC 118 and GEOS 310

Course Offered at: Prescott

WEAX 462 Numerical Weather Prediction 3 Credits (2,1)

Practical aspects of solving meteorological differential equations. Topics include data assimilation, finite difference methods, parameterization of subgrid processes, model stability, and predictability.

Prerequisites: MATH 345 and WEAX 272 and WEAX 375

Course Offered at: Daytona Beach

WEAX 466 Advanced Synoptic Analysis and Forecasting 3 Credits (2,1)

Advanced weather forecasting tools and techniques. Topics include temperature, wind, and precipitation forecasting for various hazards; Quasi-Geostrophic (QG) theory; isentropic analysis; and Potential Vorticity (PV) thinking.

Prerequisites: WEAX 375 and WEAX 378

Course Offered at: Daytona Beach

WEAX 475 Video Production 3 Credits (1,2)

Production of weather and news segments for multiplatform broadcast. Exposure to industry-standard equipment. Performing various roles in a newsroom or production studio, including writer, editor, producer, director, and on-air talent. Field production work.

Prerequisites: COMM 265 or WEAX 280

Course Offered at: Daytona Beach

WEAX 478 Boundary Layer and Mesoscale Meteorology 3 Credits (3,0)

Study of boundary layer and mesoscale meteorological processes. Topics include boundary layer turbulence, energy budget, frontogenesis, dry lines, gravity waves, convective processes, vorticity, and orographic circulations.

Prerequisites: WEAX 466

Course Offered at: Daytona Beach

WEAX 482 Research Methods in Meteorology 3 Credits (3,0)

Research techniques in meteorology, including literature review, ethical research practices, data collection, analysis, and communication of results through oral and written formats.

Prerequisites: COMM 221 and (WEAX 422 or MATH 404 or MATH 412)

Course Offered at: Daytona Beach

WEAX 490 Advanced Dynamic Meteorology I 3 Credits (3,0)

Application of physics and calculus to topics such as development of the equations of motion on a rotating Earth. Topics include geostrophic wind, gradient wind, hydrostatic balance, hypsometric equation, and thermal wind balance.

Prerequisites: MATH 243 and WEAX 354 and WEAX 420

Course Offered at: Prescott

WEAX 491 Advanced Dynamic Meteorology II 3

Credits (3,0)

Second course in atmospheric dynamics, that uses vector calculus. Topics include primitive equations, kinematic description, vorticity equations, Rossby waves, and cyclogenesis.

Prerequisites: WEAX 490

Course Offered at: Prescott

WEAX 492 Advanced Synoptic Meteorology 3

Credits (3,0)

Advanced diagnostic analysis of weather systems using vector calculus formulations of dynamic and thermodynamic equations. Topics include vertical motion and precipitation, quasi-geostrophic theory, cyclone life cycles, fronts, and severe weather. Application of computer graphics software for diagnostics.

Prerequisites: MATH 243

Course Offered at: Prescott

WEAX 493 Senior Thesis 3 Credits (3,0)

Capstone course for Applied Meteorology majors, involving research projects under faculty mentorship. Written in the style of an American Meteorological Society journal article and orally presented as a departmental seminar. Prepares students for research or technical writing.

Prerequisites: WEAX 492 and senior standing

Course Offered at: Prescott

WEAX 499 Special Topics in Meteorology 1-6

Credit (1-6,0)

Individual, independent, or directed studies of selected topics in meteorology.

Course Offered at: Daytona Beach, Prescott