

Course Syllabus

MEA 215 – Introduction to Atmospheric Sciences

Section 001

SPRING Semester

4 Credit Hours

Special Notes

Class materials including selected lecture slides, quizzes, and other materials will be posted to <http://moodle.wolfware.ncsu.edu/>

This course is designed for beginning meteorology majors and other science and engineering majors interested in meteorology. Knowledge of high school-level algebra, geometry, trigonometry, chemistry and physics is required. Students should have basic computer usage skills including web browsers and email. This course introduces students to the major concepts in atmospheric sciences and lays the foundation for more advanced courses.

Instructor's commitment. You can expect your instructor to be courteous, respectful, and punctual; be well organized and prepared for lecture and other class activities; answer questions clearly and in a positive fashion; be available for office hours or notify you beforehand if they are unable to keep them; provide email notice when class is cancelled, provide a suitable guest lecturer when they are on travel status, and grade uniformly and consistently according to the posted guidelines.

Consulting with faculty. We strongly encourage you to discuss academic questions with the instructor during office hours.

Test and lab grading. The responsibility for grading tests and labs resides with the instructor and Teaching Assistants. If you believe an error has been made in grading on an assignment or exam, prepare a written statement making your case and take it or email it to the instructor. Requests to reexamine grading will only be accepted *within 2 weeks* of the assignment being returned.

Course Description

Introduction to the Earth's atmosphere. Fundamental concepts and applications of meteorology and how they relate to daily and seasonal weather, major types of storms, and climate.

Learning Outcomes

Student learning outcomes: By the end of the course you should be able to do the following things:

Specialist Vocabulary: Recognize and define the major terms that apply to meteorology. Explain the differences between weather and climate.

Structure of the atmosphere: Explain the chemical composition and vertical temperature structure of the atmosphere.

Moisture: Define and calculate derived moisture parameters such as dew point, relative humidity, mixing ratio, and latent heat from measured atmospheric variables. Calculate properties of air parcels that are mixtures of air of different characteristics.

Stability: Explain the characteristics of atmospheric profiles in stable, unstable, and conditionally unstable conditions and the associated motion of air parcels within each type of profile. Identify the lifting condensation level and temperature inversions from atmospheric sounding data. Given a thermodynamic profile, identify layers in the atmosphere where clouds can form.

Precipitation: Explain the physical processes that form rain, snow, and hail and describe their typical sizes and fall speeds. Identify conditions where wintery mixes of rain, snow, sleet, and freezing rain can occur within the same storm.

Weather and climate variability: Identify and explain how latitude, altitude, topography, proximity to bodies of water, the diurnal cycle, and the seasonal cycle influence local weather variability and climate. Identify and explain the difference among El Niño, La Niña and neutral interannual cycles and how these influence regional weather.

Weather maps: Read, interpret and plot weather station information from weather maps. Read, interpret and plot isotherms and isobars. Determine wind direction and relative magnitude from maps of atmospheric pressure and related fields.

Storms: Explain the main 3D wind and precipitation structures within thunderstorms, mid-latitude cyclones, and hurricanes, the environments in which they form, and key ways in which these types of storms differ. Describe storm conditions where severe weather can occur and explain safety precautions for severe weather watches and warnings.

Computation: Clearly describe graph trends and characteristics. Download data and programs from an ftp site. Use Matlab to: Read in 1d and 2d data sets. Use supplied functions to plot x-y graphs, time series graphs, 2D arrays, vectors and bar plots. Utilize algebraic functions to transform data. Calculate basic statistics.

Teamwork: Work effectively in problem-solving teams.

Course Structure

Lecture twice a week (Tuesday and Thursday 1:30pm – 2:45pm)

Lab once a week (2 hours and 45 min, attend only the lab section you are enrolled in)