

**William Paterson University  
College of Science and Health  
Department of Environmental Science & Geography**

**Course Outline**

**1. TITLE OF COURSE AND COURSE NUMBER: ENV 150: METEOROLOGY**

**2. NUMBER OF CREDITS:** Three Semester Hours

**3. DESCRIPTION OF THE COURSE:**

This course deals with the factors responsible for the changes in weather and climate. Topics include the chemical and physical description of the atmosphere, circulation of air masses, weather analysis and forecasting, climatic changes, and human impact on weather and climate (air pollution, weather modification, greenhouse effect).

**4. COURSE PREREQUISITES:** None

**5. STUDENT LEARNING OUTCOME OBJECTIVES:**

Upon completion of this course successful students will be able to:

1. Predict, describe and explain daily and seasonal weather.
2. Describe and explain the structure of earth's atmosphere, the importance in variations of air pressure, the energy balance of the atmosphere.
3. Describe atmospheric optical phenomena such as blue skies, red suns and rainbows.
4. Explain the atmospheric component of the water cycle including dew, fog, clouds, and precipitation.
5. Identify, describe and understand air masses and fronts
6. Obtain, analyze and use weather data to make elementary forecasts
7. Analyze real-time weather maps from the Internet.
8. Describe and explain the formation of storms such as cyclones, thunderstorms, tornadoes, and hurricanes.
9. Integrate knowledge gained from the course and critically evaluate environmental issues such as air pollution and global warming.

**6. TEACHING METHODS:**

Two lectures per week, regular homework, daily weather observations log, exams and final. Demonstrations, observations and video presentation are incorporated into lectures. Class actively participates in demonstrations and observations.

**7. TOPICAL OUTLINE OF COURSE CONTENT:**

1. What is Meteorology? History, Atmospheric gases, Weather and Climate
2. Units and weather information
3. Vertical structure, pressure and density, ionosphere, ozone depletion
4. Energy, temperature, heat, thermodynamics 1<sup>st</sup> law, heat transfer, latent and sensible heat.
5. Radiation energy balance.

6. Variations in temperature, equinox, solstice.
7. Components of light, scattering, color, mirage, halos, and rainbows.
8. Role of H<sub>2</sub>O in atmosphere, absolute specific relative humidity, vapor pressure, dew point Impact of moisture on comfort, heat index, humidity instruments
9. Dew, fog, clouds, types, observations.
10. Stability defined & determined, adiabatic charts, cloud formation.
11. Precipitation formation, types and measurement
12. Pressure definitions, instruments, and charts.
13. Spatial scale of wind, types, instruments, charts.
14. Global winds, jet stream, ocean-atmosphere interaction including El Nino
15. Air masses and fronts, NA focus, classification, movement, charts.
16. Middle latitude cyclones, location, structure, development, factors that enhance development.
17. Forecasting methods, data acquisition, local signs, surface charts, local forecasting.
18. Thunderstorms - formation, types, lighting, tornadoes, monitoring.
19. Hurricanes- formation, paths, warning, effects.
20. Air Pollution: sources, types, important factors, effects.
21. Global Climate: temperature and precipitation distribution, climate classification and global patterns of climate, historical, causes, Milankovitch Theory, consequences.

#### **8. PERTINENT REFERENCES:**

Biel, Erwin, 1958. The Climate of New Jersey. in: *The Economy of New Jersey*, Rutgers University Press, 53-98.

Brotak, Edward, et al, 1973. A study of temperature trends (1900-1969) in New Jersey. *Bulletin of the New Jersey Academy of Science*, vol. 18 no. 2, 39-46.

Dunlap, Donald V. and G.J. Halasi-Kun, 1981. *The Climatology of New Jersey*. Pollution and Water Resources Columbia University Seminar Series, vol. 14 part 3, 254pp.

Harnack, Robert and J. Small, 2002. Identification and analysis of dry periods in New Jersey using the New Brunswick precipitation record. *Bulletin of the New Jersey Academy of Science*, vol. 47, no. 1, 1-6.

Harrington, K., 1996. *Climate Change and Urban Drought in Northern New Jersey*. Ph.D. dissertation. Department of Geography, Rutgers University, 354pp.

Karl, Thomas, et al, 1983. Statewide Average Climatic History - New Jersey 1885-1982. *NOAA Historical Climatology Series 6 - 1*, 25pp.

Savadove, L. and M. T. Buchholz, 1993. *Great Storms of the Jersey Shore*, Down the Shore Publishing, Harvey Cedars, NJ, 203pp.

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