Master Syllabus
Department of Geography

GEOG 425/525: Physical Meteorology

Course Description

Study of the physical processes of the atmosphere with a focus on solar and terrestrial radiation, clouds, and precipitation. (3 credit hours).

Prerequisites: GEOG 330 (or 530); MATHS 165; PHYCS 120; or permission of the instructor

Course Objectives

The objective of the course is to introduce students to the central role that radiation (solar and terrestrial), cloud physics, turbulence, and surface elements play in meteorology. After completing this course, students will be able to:

- Explain the radiation processes of the atmosphere using mathematics and physics
- Assess the impact that changes to gases in the current atmosphere would bring
- Understand the dynamics of cloud formation and precipitation processes
- Critically evaluate different representations or models of the earth-atmosphere system
- Evaluate the impact of turbulence and surface factors on flow of air in the boundary layer

Course Rationale

This course is part of Option IV's Professional Meteorologist Track, which is designed to meet the requirements for employment by the National Weather Service (NWS) as a meteorologist (GS-1340). Physical Meteorology is required by both the NWS and the American Meteorological Society as part of a meteorology (or meteorology-equivalent) degree.

Course Content and Format

The course material focuses on radiation processes and atmospheric physics within the boundary layer. The course is fundamentally quantitative, with the relevant concepts explained and examined in a mathematical context. Topics include:

- Solar and terrestrial radiation; impacts of differing albedos on temperature
- Feedbacks in the atmospheric system

- Boundary layer wind flow
- Precipitation processes
- Cloud physics
- Water in the atmosphere
- Turbulent fluxes in the atmosphere

The course format is a combination of lecture and discussion. Students are actively encouraged to participate in discussions, as well as deliver presentations on relevant topics or journal articles.

Textbook Suggestions and Course Resources

Boundary Layer Climates (T.R. Oke), 2nd ed. Routledge. 1987

An Introduction to Boundary Layer Meteorology (Roland B. Stull). Kluwer Academic Publishers, 1988.

Journal articles from relevant academic journals

Websites pertinent to course material (e.g. NOAA, Lamont-Doherty Earth Observatory, NASA)

Methods for Evaluating Student Performance:

Student performance will be evaluated via some combination of the following methods:

- Examinations
- Homework exercises (math- and physics-based)
- Participation in class discussions
- Presentations
- Quizzes

Students enrolled in GEOG 525 (graduate level) will be required to complete additional work (such as a term paper, lecture on specialized topic relevant to the course).

Evaluation of the Course

Student evaluation of the course will be accomplished using university (and departmental) course evaluation forms. Departmental evaluation may include peer or chair evaluations.