

**Geography 221**  
**Strange & Dangerous Weather**  
**Spring 2009**  
**Tuesday and Thursday 11:00am – 12:15pm**  
**Room: MacKay Science 321**

Instructor: Dr. Jeffrey Underwood  
Office: MS 226  
Telephone: 784-6999  
Email: [jeffu@unr.edu](mailto:jeffu@unr.edu)

**Course Goals**

The course has been designed to introduce the student to the processes and patterns associated with extreme and unusual weather phenomena. The design of the course allows the student to develop fundamental knowledge about the processes operating in the atmosphere. The course allows students to apply this knowledge in the context of investigations of strange and hazardous weather events. The goals of the course follow:

- Introduce students to the study of weather and climate
- Introduce students to the technology used in the physical sciences
- Help students build analytical skills in an interesting environment
- Help students access and interpret physical science data sets

**Course Objectives**

Upon completing the course students should be able to:

- Define the characteristics of particular weather phenomena
- Articulate the physical principles that govern the development of particular weather systems
- Interpret the geographic distribution of weather hazards
- Discuss current methods and technologies employed in forecasting severe weather

**Description of Assignments**

Assignments during the course will consist of quizzes, examinations, and writing projects. Quizzes will test the student's ability to interpret case-studies and other analyses presented in class. Examinations will allow the student to articulate information gained in class from lectures and from outside reading and analysis. A single written assignment and presentation will allow the students to expand and synthesize information from various sources and to organize their work for evaluation by the instructor and peers

**Grading Criteria**

<b><i>Item</i></b>	<b><i>Percentage of Final Grade</i></b>
Quizzes (4)	40%
Exams (2)	40%
Written Project/Presentation (1)	15%
Participation	5%

**Required Text**

*Severe & Hazardous WEATHER: An Introduction to High Impact Meteorology, 2<sup>nd</sup> Edition*, Rauber, Walsh, and Charlevoix, 2005, Kendall/Hunt Publishing Company, Dubuque Iowa.

## **Lecture Schedule, Topics and Assigned Reading**

**Week 1: Reading**→Chapter 1 in text

**Lecture 1**(Jan 20): **Overview of Course/Discussion of Syllabus, Questions**

**Lecture 2**(Jan 22): **Overview of Climate Hazards**

- How are weather hazards identified and analyzed
- Historic weather events

**Week 2: Reading**→Chapter 1 and 8 in text

**Lecture 1**(Jan 27): **Properties of the Atmosphere**

- Solar and Terrestrial Radiation
- Temperature
- Air Masses
- Cold and Warm Fronts

**Lecture 2**(Jan 29): **Properties of the Atmosphere**

- Heat
- Heat Flux
- Vertical structure of atmosphere

**Week 3: Assigned Reading**

**Lecture 1**(Feb 3): **Atmospheric Moisture**

- Water vapor in the atmosphere
- Phase changes of water

**QUIZ 1 & Lecture 2**(Feb 5): **Atmospheric Motion**

- Clouds & Precipitation

**Week 4: Reading**→Chapter 5 and 7 in text

**Lecture 1**(Feb 10): **Properties of the Atmosphere**

- Pressure Gradients
- Wind
- Controls of pressure changes

**Lecture 2**(Feb 12): **Properties of the Atmosphere**

- Atmospheric stability
- Stability and severe weather

**Week 5: Reading**→ Chapter 2 and 3 in text

**Lecture 1**(Feb 17): **Meteorological Measurements**

- Surface observations
- Upper-air observations
- Weather Radar & Weather Satellites

**Lecture 2**(Feb 19): **Weather Maps**

- Surface maps
- Station model
- Plots

**Week 6: Reading**→ Chapter 3 and 4 in text

**Lecture 1**(Feb 24): **Weather Maps**

- Upper air maps/plots
- Variables for upper-air analysis
- High Pressure, Low Pressure & Tropospheric Waves

**QUIZ 2 & Lecture 2**(Feb 26): **Forecasting Severe Weather**

- National Weather Service Warnings
- Meteorological Models
- Severe Weather Indices

**Week 7: Reading**→ Chapter 8 and 9 in text

**Lecture 1**(Mar 3): **Weather Hazard—Extra-tropical Cyclones**

- What is an ETC
- The global role of ETC
- ETC Model

**MID-TERM EXAM (Thursday March 5, 2009)**

**Week 8: Reading**→ Chapter 9 and 10 in text

**Lecture 1**(Mar 10): **Weather Hazard—Extra-tropical Cyclones**

- Precipitation and Wind with a mature ETC
- Formation regions in North America
- Forecasting ETC's
- ETC Case Study

**Lecture 2**(Mar 12): **Weather Hazard—Fog**

- Geography of radiation fog
- Central California radiation fog
- Using satellite imagery to view fog at night
- Forecasting Fog

**SPRING BREAK March 16-20**

**Week 9: Reading**→ Chapter 12 & 16 in text

**Lecture 1**(Mar 24): **Strange Weather—Mountain Clouds**

- Process of Lenticular cloud formation
- Mountain wave clouds
- Cumulus clouds in mountain areas
- Mountain wave Case Study

**QUIZ 3 & Lecture 2**(Mar 26): **Weather Hazard—Mountain Snowstorm**

- Sierra Nevada snowstorms
- Temperature, Moisture, Lift
- Forecasting SN snowstorms
- Historic SN snowstorms

**Week 10: Reading**→ Chapter 11 & 15 in text

**Lecture 1**(Mar 31): **Strange Weather—Lake-effect Snow**

- Geography of LES
- Climatology of LES
- LES process
- Forecasting LES
- Case study of LES at Lake Tahoe

**Lecture 2**(Apr 2): **Weather Hazard—Ice Storms**

- Anatomy of a sleet event
- Climatology of sleet in US
- Forecasting sleet

**Week 11: Reading**→ Chapter 11 in text

**Lecture 1**(Apr 7): **Weather Hazard—Freezing Rain**

- Anatomy of a freezing rain event
- Climatology of FR in US
- Forecasting FR

**Lecture 2**(Apr 9): **Weather Hazard—Thunderstorms**

- Season distribution of thunderstorms
- Pre-conditions to thunderstorm developments
- Climatology of TR in US
- Forecasting TR

**Week 12: Reading** → Chapter 17 in text

**Lecture 1**(Apr 14): **Strange Weather—Hail**

- Process of hail production
- Climatology and Geography of Hail events in US
- Forecasting Hail

**QUIZ 4 & Lecture 2**(Apr 16): **Weather Hazard—Lightning**

- Cloud-to-ground lightning process and outcomes
- Geographic distribution of lightning in US
- Average number of lightning strikes in US
- Lightning research in US and the NLDN

**Week 13: Reading** → Chapter 18 & 23 in text

**Lecture 1**(Apr 21):

**Weather Hazard—Tornado**

- Conditions conducive to tornado generation
- Development of a tornado
- Forecasting tornadoes
- Historic tornadoes in the US

**Lecture 2**(Apr 23): **Weather Hazard—Tropical Cyclones/Hurricanes**

- Seasonal distribution of tropical cyclones
- Geographic Distribution of tropical cyclones
- Saffir-Simpson Scale
- Structure of hurricanes as viewed from weather satellites
- Records for death and damage from hurricanes
- Forecasting and tracking hurricanes

**Week 14:**

- **(Apr 28): Presentations of Research Papers/Posters**
- **(Apr 30): Presentation of Research Papers/Posters**

**Week 15:**

**Tuesday, May 5 Review Day**

**FINAL EXAM → Thursday, May 7 (7:30am—9:30am)**