

Geography 221
Strange & Dangerous Weather
Fall 2011
Monday and Wednesday 7:00 – 8:15 PM
Room: Mackay Science 321

Instructor: Jeff Thompson
Office: MS 315 (Office Hours: Following class or by appointment)
Telephone: 247-8193 (cell) 784-1723 (office)
Email: jeffreyt@unr.edu

Course Goals

1. Get a basic introduction to the study of weather and climate
2. Develop fundamental knowledge about the processes operating in the atmosphere
3. Earn general understanding of the processes and patterns associated with extreme and unusual weather phenomena
4. Examine the geographic distribution of weather of weather hazards
5. Achieve a basic understanding of the technology used in the physical sciences
6. Build a cloud atlas, learning cloud types associated with discussed processes

Description of Assignments

1. **Quizzes:** Test knowledge on recent topics of study and assignments
2. **Examinations:** Test cumulative knowledge gained from class lectures and outside reading and analysis
3. **Project:** A written assignment and presentation utilizing information from various sources and evaluated by the instructor and peers
4. **Participation:** Assignments, Pop Quizzes, Instructor evaluation of participation

Grading Criteria

<i>Percentage of Final Grade</i>	<i>Scale</i>
Quizzes (4): 40%	A: 100-90
Exams (2): 40%	B: 89-80
Project (1): 10%	C: 79-70
Participation: 10%	D: 69-60
	F: <60

Required Text

Severe & Hazardous WEATHER: An Introduction to High Impact Meteorology, 3rd Edition, Rauber, Walsh, and Charlevoix, 2008, Kendall/Hunt Publishing Company, Dubuque Iowa.

Outside Class Activity/Project- NWSFO Reno Visit/Substitute Project

Lecture Schedule, Topics and Assigned Reading

Week 1: Reading→ Chapter 1 in text

Lecture 1 (Aug 29): **Overview of Course/Discussion of Syllabus, Questions**

- How are weather hazards identified and analyzed?
- Historic weather events
- Cloud Types

Lecture 2 (Aug 31): **Properties of the Atmosphere**

- Composition and Structure of the Atmosphere
- Solar and Terrestrial Radiation
- Introduction to Temperature, Pressure, Moisture, and Wind

Week 2: Reading→ Chapter 1, 5 (p 86-91), and 9 (p 166-167) in text

Labor Day (Sept 5- No Class)

Lecture 3 (Sept 7): **Atmospheric Motion**

- Earth-Sun Relationship
- Global Circulations
- Air Masses

Week 3: Reading→ Chapter 7 and 8 in text

Lecture 4 (Sept 12): **Atmospheric Motion**

- Pressure Gradients and Force Balances
- Geostrophic Wind and Balance
- Jetstreams and Jetstreaks

Lecture 5 (Sept 14): **Pressure Systems**

- Convergence and Divergence
- High and Low Pressure Systems/Ridges and Troughs
- Semi-permanent Highs and Lows
- Blocking Patterns

Week 4: Reading→ Chapter 6 in text

QUIZ 1 and **Lecture 6** (Sept 19): **Atmospheric Stability**

- Concept of Stability
- Lapse Rates
- Stability and Severe Weather

Lecture 7 (Sept 21): **Atmospheric Stability**

- The Skew-T Diagram
- Inversions and Air Quality Issues
- Stability Indices and Severe Weather

Week 5: Reading→ Chapter 2, 3, and 4 in text

Lecture 8 (Sept 26): **Meteorological Measurements and Weather Maps**

- Surface and upper-air observations
- The Station Model
- Remote Sensing: Weather Radar & Weather Satellites

Lecture 9 (Sept 28): **Weather Maps, Modeling, and the National Weather Service**

- Plots, Surface Maps
- Weather Models and Forecasting
- The National Weather Service/Issued Products

Trip to NWSFO Reno on a Friday in October (3-6 PM)

Week 6: Reading→Chapter 9, 10, and 11 in text

QUIZ 2 & Lecture 10 (Oct 3): Dangerous Weather: Extra-Tropical Cyclones

- Definition and Development
- Global Role and Source Regions
- Fronts- Cold, Warm, Occluded, and Stationary
- Life Cycle of the ETC

Lecture 11 (Oct 5): Dangerous Weather: Extra-Tropical Cyclones

- Nor'easters, Superstorms, and Meteorological Bombs
- Forecasting Challenges

(Hand out Mid-Term Exam Review)

Week 7: Reading→Chapter 26 and 27 **Study**→ Mid-Term Concepts

Lecture 12 (Oct 10): Dangerous Weather: Heat Waves, Drought, and Wildland Fires

- Heat Waves- Causes, Impacts, Historical Events
- Drought- Causes, Definition, Historical Events
- Nevada Drought Plan and History
- Wildland Fires: Genesis and Growth Due to Weather
- **Mid-Term Exam Review Q&A**

MID-TERM EXAM (Wednesday October 12, 2011)

(Hand out Project Assignment and Select Topics)

Week 8: Reading→Chapter 16 and 17 in text

Lecture 13 (Oct 17): Strange Weather: Mountain Clouds and Winds

- Process of lenticular cloud formation
- Mountain wave clouds
- Cumulus clouds in mountain areas
- Zephyrs, Chinooks, Katabatic Winds, and Santa Anas

Lecture 14 (Oct 19): Dangerous Weather: Mountain Snowstorms and Windstorms

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

Week 9: Reading→Chapter 25 in text

Lecture 15 (Oct 24): Dangerous Weather: Floods

- Types of Flooding
- Geography of Flooding
- Flood plains, river stages, reservoirs, and watersheds
- Historic Floods
- Flooding Forecasting and Safety
- Landslides

Lecture 16 (Oct 26): Dangerous Weather: West Coast Flood of 1997

- **Mid-Term Return and Review**
- "Pineapple Express"
- Guest Lecture

Week 10: Reading→ Chapter 13 and 24 in text

Lecture 17 (Oct 31): **Dangerous Weather: Tropical Cyclones**

- 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

QUIZ 3 & **Lecture 18** (Nov 2): **Strange Weather: Lake Effect Snow**

- Definition and Development Process
- Geography and Climatology
- Lake-Effect Snowbelts and Historic Storms
- Forecasting LES
- LES on Lake Tahoe

Week 11: Reading→ Chapter 18, 20, and 21 in text

Lecture 19 (Nov 7): **Dangerous Weather: Thunderstorms**

- Thunderstorm Climatology
- Thunderstorm Types
- Life Cycle of the Airmass Thunderstorm
- Anatomy of the Supercell Thunderstorm
- Thunderstorms and Doppler Radar

Lecture 20 (Nov 9): **Strange and Dangerous Weather: Hail and Lightning**

- Process of Hail Production
- Climatology and Geography of Hail Events in the U.S.
- Lightning Analysis and Types
- Geographic Distribution of Lightning Strikes in the U.S.

Week 12: Reading→ Chapter 19 and 22 in text

Lecture 21 (Nov 14): **Dangerous Weather: Tornadoes**

- Conditions conducive to tornado generation
- Development and Life Cycle of a Tornado
- Enhanced Fujita Scale
- Forecasting and Detecting Tornadoes
- Historic tornadoes in the US

Lecture 22 (Nov 16): **Strange Weather: Tornadoic Cousins, Wannabes, and Look-alikes**

- Land Spouts and Water Spouts
- Microbursts and Gustnadoes
- Dust Devils
- Cold Core Funnels

Week 13: Reading→ Supplemental Materials

Lecture 23 (Nov 21): **Strange and Dangerous Weather: Fog**

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

Thanksgiving Eve (Nov 23- No Class)

Week 14: Reading→ Chapter 12 and 15 in text

QUIZ 4 & **Lecture 24 (Nov 28): **Strange Weather: Optical Phenomena****

- Rainbows and Rainbow Relatives
- Haloes, Sundogs, Auroras

Lecture 25 (Nov 30): **Dangerous Weather: Winter Storms**

- Types of Winter Precipitation
- Blizzards- Definition and Historical Events
- Ice Storms- Definition and Differences
- Climatology and Forecasting for Sleet and Freezing Rain

(Hand out Final Exam Review)

Week 15: Project Presentations

(Dec 5): Presentations of Projects

(Dec 7): Presentations of Projects

Week 16: Study→ Course Concepts/Study Guide

(Dec 12): Presentations (if necessary)

Review Day (Final Exam Review Q&A)

FINAL EXAM → Monday, December 19 (7:30-9:30 PM)