

**Master Syllabus**  
***Department of Geography***

**GEOG 334/534: Atmospheric Hazards**

**Course Description**

Examination of the causes, consequences, and spatial distribution of hazards deriving from or impacting the atmosphere. Both the physical properties and processes of hazards (e.g., hurricanes, tornadoes, biochemical) and the human actions and reactions to these hazards will be emphasized at the local, regional and global scales. (3 credit hours).

Prerequisite: GEOG 101, GEOL 101 or instructor permission

**Course Objectives**

This course will examine the spatial variability of numerous types of past, current and potential natural and human induced hazards affecting the human and physical landscape. An overview of the theories, processes and applications of natural and technological hazards from a geographic perspective will be presented. Topics include investigation beyond the basic physical processes to include mitigation strategies and emergency management considerations. Through a series of case studies, the short and long-term physical and societal impacts of environmental disasters will be explored, including aspects of disaster mitigation efforts and policy. By the end of this course, student should be able to:

- Locate regions that pose the greatest risk for atmospheric related disasters
- Explain the physical and social processes that make some regions more prone to disaster
- Identify human induced changes to the landscape that can escalate disaster risk potential
- Propose potential policies for emergency management and minimization of disaster impacts
- Synthesize and apply hazard theories to “real-world” problems

**Course Rationale**

Hazards, both natural and anthropogenic induced, propose many significant and dramatic impacts to our present and future livelihood. This course will lead to a better understanding of various hazards from a learning of combination of theory and practical applications for students to address these types of problems. This class can meet a course requirement in all four options across the geography major, including a required core course for our Option 4: Meteorology and Climatology majors. Additionally, this course will be of those with interests in natural resources, geological sciences,

homeland security, emergency management, and environmental policy, among others.

## **Course Content and Format**

Students will be presented material in a lecture and seminar-style format that will include class discussion on various case studies related to the hazard under consideration. The following shows an example of a potential outline of topics for this course, with time allotment for each topic at the discretion of the instructor:

### **I. Introduction to the Environmental Hazards**

- A. History and recent trends
- B. Hazards vulnerability
  - 1. Defining risk
  - 2. Risk perception
- C. Overview: Hazard mitigation efforts and policy

### **II. Atmospheric Hazards: Direct**

- A. Tropical systems: Hurricanes/typhoons  
Case Study: 2005 Hurricane Katrina
- B. Winter storms: Blizzards and ice  
Case Study: "The Perfect Storm"
- C. Mesoscale meteorology: thunderstorms, tornadoes, hail and excessive wind  
Case Study: Palm Sunday tornado outbreak
- D. Droughts and floods  
Case Study: 1993 U.S. Midwest Flood
- E. Atmospheric circulation shifts: atmospheric and oceanic teleconnections patterns  
Case Study: the El Niño-Southern Oscillation and Peruvian cholera epidemics

### **III. Atmospheric Hazards: Indirect**

- A. Volcanism: tropospheric and stratospheric effects (e.g., decreased insolation)  
Case study: 1991 Mt. Pinatubo eruption
- B. Extraterrestrial:
  - 1. Asteroids and comets  
Case Study: Historical mass extinctions and climate change
  - 2. Solar related: flares, sunspot cycles, and magnetic storms  
Case study: the Maunder Minimum and the "Little Ice Age"
- C. Chemical releases: biohazards and bioterrorism  
Case Study: 1986 Chernobyl nuclear disaster

- D. Temperature extremes: heat waves, cold spells and wildfire incidence  
Case Study: Summer 2003 heat wave mortality in western Europe
- E. Biosphere impacts: deforestation and desertification  
Case Study: Brazil and the carbon cycle
- F. Anthropogenic climate change

### **Textbook Suggestions**

Bankoff, G., G. Frerks, and D. Hilhorst (2004): *Mapping Vulnerability: Disasters, Development and People*. Earthscan Publications Ltd., pp. 356.

Schwab, A. K., K. Eschelbach, and D. J. Brower (2006: *Hazard Mitigation and Preparedness*, Wiley, pp. 568. (Part of an emergency management series)

Smith, K. and D. Petley (2009): *Environmental Hazards: Assessing Risk and Reducing Disaster* (5th Ed.), Routledge, pp. 416.

Stallings, R. (Ed.) (2003) *Methods of Disaster Research*. Xlibris Corporation, pp. 528

Tobin, G. and B. E. Montz (2007) *Natural Hazards: Explanation and Integration*, The Guilford Press pp. 388

#### *Reference Textbooks (for review purposes)*

Abbott, P. L., 2007: *Natural Disasters* (6<sup>th</sup> Ed.), McGraw-Hill Science, pp. 510. ISBN-13: 978-0073292328

Keller, E. A. and R. H. Blodgett, 2005: *Natural Hazards: Earth's Processes as Hazards, Disasters and Catastrophes*, Prentice Hall, pp. 432. ISBN-13: 978-0130309570

#### *Supplement with articles from journals such as:*

- Physical Geography
- Natural Hazards Review
- Annals of the Association of American Geographers
- Disasters
- Science

### **Methods for Evaluating Student Performance:**

Forms of evaluation might include examinations, quizzes, short papers or assignments, presentations and a final project. Students may also be asked to read book about a popular science book about an atmospheric hazard (e.g., *Isaac's Storm*) and write a critical book review. Graduate students enrolled in the course as Geography 534 would be expected to accomplish an additional work load (e.g., a term paper or extra exam questions). Another option for graduate students would be to teach one full 50-minute lecture during the semester on a topic of their choosing, such as atmospheric hazard from a case study perspective. Graduate students are then responsible for devising and grading a short assignment for the undergraduate students based on their topic

### **Evaluation of the Course**

Student evaluation of the course, administered anonymously.