

GGS 302

Global Environmental Hazards

Fall 2015 semester (08/31-12/21)

Lecture: Every Tuesday and Thursday 01:30 pm-02:45 pm

EXPL 2103

Instructor

Donglian (Lillian) Sun

Associate Professor

Department of Geography and Geoinformation Sciences (GGIS)

Contacts

Office: Exploratory, room 2413

Telephone: 703.993.4736

email: dsun@gmu.edu

### **Abstract**

Every year several catastrophic natural hazards strike somewhere on Earth. These may cause thousands of lives, cause damages of billions of dollars, destroy natural landmarks, cause tsunamis, floods, landslides, and at worst even trigger an economic depression that might affect directly or indirectly the entire world, render a large territory uninhabitable or destabilize the military and political balance in a region. Most of these events are caused by nature but their potential catastrophic consequences are tied to overcrowding and the emergence of megacities; the proliferation of nuclear power plants and nuclear waste storage facilities; and the existence of high dams, and other facilities whose destruction pose an unacceptable risk of global reach. Thus the study of natural hazards and of the processes that govern their occurrences has become a fundamental challenge for the survival of our civilization.

The course will focus on the governing dynamics for different hazards, including but not limited to earthquakes, volcanic eruptions, severe weather and cyclones, increasingly harmful dust storms, floods, droughts, and at local scales avalanches and landslides. The course will concentrate on observing, tracking and even forecasting such events using primarily satellite based observations. These can be used to monitor the Earth's surface and atmosphere to give early warning information about impending hazards and information for risk management and disaster relief.

Each class will consist of either a lecture by the instructor and/or a guest speaker, or by a class discussion. Each lecture will focus both on the governing dynamics of one or more hazards, and the satellite data available for the study of each hazard. Students are encouraged to suggest topics of their interest which can be studied more in depth.

Students will be required to complete a term project and submit a final report related to the use of remote sensing data to study a natural hazard of their choice, as well as to give presentations, complete homework assignments and actively participate in each lecture.

### **Grading**

**The final grade is computed out of 100 points using the following letter mapping:**

**100-96 A+; 95-93 A; 92-90 A-;**

**89-87 B+; 86-83 B; 82-80 B-;**

**79-77 C+; 76-73 C; 72-70 C-;**

**69-60 D; < 59 F**

#### **15% Attendance, Participation and Preparation**

Attendance will be taken at the beginning of each class. Students more than 15 minutes late will be considered absent. Two absences are allowed with no penalty. One point will be taken for each additional absence up to a total of 12 absences. Students absent for more than 12 lectures will receive an F. Oral questions about the course material and the reading assignments will be asked and students are expected to actively participate in the discussion.

#### **35% Homework**

Students will be divided in groups of 3-4 students. Each group will be assigned a specific region of the world, and throughout the class each group will investigate how specific hazards affect their region. Students are encouraged to use for their research from any sources they believe appropriate. Students will be asked to provide an oral summary of their findings in class.

#### **20% Midterm**

The midterm covers material from both lectures and assignments. This is an individual, closed book, in class exam.

#### **30% Final Exam**

The final exam covers material from both lectures and assignments. This is an individual, closed book, in class exam.

### **Policies**

#### **Policy on Absence**

Students are expected to actively participate in the lecture, lab and class discussion. When a student misses a lecture, he/she is invited to let the instructor know in advance. The student is still responsible for the material and assignments covered in the lecture.

Refer to the attendance section of the Syllabus for grading information.

## **Policy on Exams**

The midterm and the final exams are mandatory. There is no make up exam, unless for extreme circumstances. If a student does not take the midterm exam, he/she will receive a 0 score. If a student does not take the final exam, he/she will receive an F grade.

## **Policy on Late Work**

Homework will be due after two weeks of the assignemnt. 2 points will be taken for each 24 hours starting from 14:00 of the due date.

## **Policy on Reading Assignments**

Students are required to read the book chapter relative to each lecture BEFORE coming to class. Questions about the text will be asked during the lecture, and students are expected to be able to answer them.

## **University Policies**

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.

## **GMU EMAIL ACCOUNTS**

Students must use their Mason email accounts-either the existing MEMO system or a new MASONLIVE account to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.

## **Honor Code**

Students must strictly follow the honor code, both for individual and team work. No exception will be made. University policy requires that faculty members report incidents of Honor Code Violation. Scholastic dishonesty includes but is not limited to plagiarism (reference your sources and quotations), copying others' work, limiting others' access to course materials, sabotaging others' work, turning in the same paper or project for two classes without permission from all instructors, and many other things. You are responsible for the GMU Scholastic Honor Code, found in the GMU University Catalogue.

## **Students with Disabilities**

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

## **Class Cancellation**

If a class is cancelled due to inclement weather or other reasons, the syllabus will be updated as early as possible. Best efforts will be made to send each student an email with information on the

cancellation of class. Make up classes will be scheduled during the next lecture. When an exam is cancelled, it will be given during the next lecture.

### **Class Material**

#### **Suggested Textbook (Suggested)**

#### **Natural Hazards and Disasters**

by Donald Hyndman, David Hyndman

Paperback: 528 pages

Publisher: Brooks Cole; 4 edition

Language: English

ISBN-13: 978-1133590811

ISBN-10: 1133590810

### Schedule

#### **Lecture I**

Introduction, Natural Hazards and Disasters

Class discussion: Which hazards are most dangerous? Which parts of the world are most at risk from natural hazards, and which parts are safer?

#### **Lecture II**

Earthquakes

Class discussion: How can we mitigate earthquake risks?

#### **Lecture III**

Earthquake forecasting

Class discussion: What can earthquake forecasting really do?

#### **Lecture IV**

Volcanic eruptions

Class discussion: Types of volcanoes and their location

#### **Lecture V**

Landslides and Other Downslope Movements

Sinkholes, Land Subsidence, and Swelling Soils

### **Lecture VI**

Tsunami

Class discussion: What causes tsunami and their destructive power

### **Lecture VII**

Severe weather, Thunderstorms, and Tornadoes

Class discussion: What are Tornadoes, and why do they exist. Are hurricanes increasing in strength and frequency?

### **Lecture VIII**

Global climate change

Class discussion: The economics of pollution. How much does it cost not to pollute?

### **Lecture IX**

Midterm

### **Lecture X**

Hurricanes

Class discussion: What are hurricanes and why do they exist. Are hurricanes increasing in strength and frequency?

### **Lecture XI**

**Floods**

Class discussion: How can remote sensing help in studying and preventing floods?

### **Lecture XII**

**Droughts**

Class discussion: How can remote sensing help in studying and preventing droughts?

### **Lecture XIII**

Wildfires

Class discussion: The importance of forests and the consequences of their destruction

### **Lecture XIV**

Review, The Future: Where Do We Go from Here?

**Lecture XV**

**Review for Final Exam**

Final Exam

