ISNS 4359 EARTHQUAKES & VOLCANOES Spring 2006: COURSE DESCRIPTION, SCOPE, OBJECTIVES MC 2.110

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***Earthquake*:** (n) 1. sudden violent movement (shaking or trembling) of the Earth's surface, sometimes causing great damage, caused by the stress release across a fault or by volcanic activity. [*earth*, from 8th century OE oerpe, ground. *quake*, from 12th century OE cwac, cwakien, to shake, agitate; 1280 *oerthequakynge*] 2. *Braza media*, species of grass, common in England.

***Volcano*:** (n) 1a. a conical mountain. 1b. a vent in a planet's crust through which solids, liquids and/or gases are ejected. Volcanoes can be mountains, cracks, or craters; active, dormant, or extinct. 1c. a violent feeling or passion. (v) 1. a violent attack, to blaze or belch forth. [16th century Latin, *Volcanus*, burning mountain, *Vulcan*, Roman God of fire and metal-working, seated at Mt. Etna.]

Course Description

Seismicity and volcanism are important expressions of earth processes that shape the planet and affect humankind in both beneficial and adverse ways. Volcanoes fascinate us with their apparently calm majestic peaks and potential power of calamitous destruction. Volcanoes and earthquakes can induce great floods of mud and massive tsunami, crush and bury cities, and even degrade global climate. Volcanoes are also benevolent, ultimately the source for much of the water in our oceans and lakes, the air we breathe, fertile soil for growing coffee and vineyards, new land in tropical paradise settings, renewable geothermal and hydroelectric power, building materials, gems, metals, ski slopes, and scenic beauty. This course provides a broad overview of the science behind earthquakes and volcanoes, new insights they provide about the architecture, processes, and evolution of the earth, and their impact on humankind and other organisms. The plate tectonics model provides the central framework in which the many aspects of earthquakes and volcanoes are described.

Course Scope

This course provides a description of relevant natural phenomena, observation methods, quantification measures, causes, models, theories, hazards, prediction, and other aspects impacting the world's cultures. Two 75 minute-long lectures will be provided per week with as active student discussion as possible, supplemented by rocks, props, physical examples, web resources, DVD videos, and computer projected images. Graded assignments include problem sets, a current event journal, a short paper, and three tests.

Course Objectives

The main goals of this class are to increase awareness and develop an appreciation of the role of earthquakes and volcanoes in our lives, provide a framework and explanation of these natural phenomena, and basic information to assist the student in making well-informed, safe, and wise life-decisions. Other desired objectives will also be considered.

Required Textbook

Natural Disasters by Patrick Abbott (2006, 5th edition, though you can also get the older 4th edition, 2004). Published by McGraw Hill.

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CLASS POLICIES

Class Attendance & Participation: Attending class and actively participating in it are *highly* recommended. Short (5-10 min) quizzes will be given at the beginning of five random class meetings to provide extra credit, and motivate attending class and reading the textbook (no make-ups). Class participation includes asking intelligent questions during the Q&A portion of lectures and contributing current events and humorous items related to earthquakes and volcanoes in the news. Students asking the most insightful questions and/or making particularly profound observations will be awarded extra credit (subjectively judged by the instructor).

Reading assignments: Textbook readings are intended for study before class; lectures will be given assuming a certain level of background and familiarity. Readings and lectures do not necessarily cover identical materials; they are intended to complement each other. The short quizzes will be taken from previous lecture materials. Other book, journal, web and electronic resources can be found on the links in the course WebCT homepage. Course content includes the textbook and lecture materials. Handouts will be provided for each class to summarize class content and to fill any textbook gaps.

Journals: Two Journals (I & II) will be due by the end of class on 20Feb06, & 27Mar06. Journals will deal with descriptions of 1 current earthquake or volcano event per week over a 4 week period (including sketch maps and cross sections describing the plate tectonic framework), following the assigned format (see 18 Jan06 handout).

Tests: Test materials will be taken both from the textbook (see discussion in syllabus below), handouts, and lectures. Tests will include ~50 multiple choice, fill in the blank, T/F, sketch/diagram, or short answer questions. A pre-test review will take place during the class meeting prior to the test. Tests will be reviewed in class approximately one week after they are given.

Test Make-up: Tests will not be taken at any time except during the scheduled in-class period, unless the instructor agrees to reschedule an individual's test as the result of a prior agreement, or a doctor's excuse certifies the student was too ill to attend class the day of the examination. If you have health problems, or extenuating circumstances, please contact the instructor as soon as possible so arrangements can be made.

Paper assignment: An original paper on a unique topic is due late in the term. The paper (concise, ~1 page long in outline form) can be on a variety of particular earthquake or volcano events (*excluding* those listed on the syllabus-everyone must sign up for a topic by 13Feb06 to eliminate the possibility of duplication). Paper details, expectations, topics, sources, etc. will be provided when assigned on 1Feb06.

Grading policy: You can keep track of your grades by checking the course WebCT page (link available on the UTD homepage). The final grade is based on the following percentile divisions A+: 97.1-100; A: 93.1-97; A-: 90.1-93; B+: 87.1-90; B: 83.1-87; B-: 80.1-83; C+: 77.1-80; C: 73.1-77; C-: 70.1-73, D=60.1-70, F<60. The final grade will be based on a complex distribution; the shape of the curve is subject to the instructor's discretion, incorporating individual graded assignments, test grades, and class participation. Short pop quizzes will be given in 5 random class meetings and will serve as extra credit opportunities.

Grading components:	**(total 600 points)**	**(100%)**
3 tests, 100 points each	300	(50%)
Feb & Mar "Journals" (75 pts each)	150	(25%)
1 original paper	100	(17%)
class participation	50	(8%)
Extra Credit 5 pop quizzes, 10 points each	50	(potential+8%)

ISNS4359 Spring 2006 Syllabus **(Book readings*) & assignments**

(30 class meetings, including 27 lectures & 3 tests) **Room MC2.110**

1	Jan. 9 (Monday)	**Lecture i,** Course Introduction & Overview of Natural Disasters	(ch. 1)

Part I. Quakes & Plates

2	Jan. 11	**L1.** Matter, Earth, sources of energy	(ch. 2)
3	Jan. 16	MLK University Closed	
4	Jan. 18	**L2.** Plate Tectonics	(3: 50-75) Journal handout
5	Jan. 23	**L3.** Faults & Seismic Waves	(4: 78-91)
6	Jan. 25	**L4.** Seismograms, Locating EQ, EQ Magnitude, Intensity, & Recurrence	(4: 92-105)
7	Jan. 30	**L5.** Seismology; First Motions, Man-made seismicity; Tsunami	(4: 106-113)
8	Feb. 1	**L6.** Modern EQ – Sumatra, Dec 2004	assign paper
9	Feb. 6	**L7.** Historic EQ I. Lisbon 1755, SF 1906, AK 1964	(78-79, 123-125, 116-117)
10	Feb. 8	**L8**. Historic EQ II. Loma Prieta 1989, Northridge 1994	(142-3,157-161)
11	Feb. 13	**L9.** Historic EQ III. Kobe 1995, Izmit 1999; Bam 2003 paper topic sign up due	(135-136, 70-71, 4-5)
12	Feb. 15	**L10.** Historic EQ IV. New Madrid 1811-1812	(6) journal I due
13	Feb. 20	**Exam I:** Plate Tectonics & Earthquakes	

Part II. Volcanoes & Plates

14	Feb. 22	**L11.** Magma, Lava, & Plate Tectonics	(ch 7)
15	Feb. 27	**L12.** Continental Volcano Architecture	(7)
16	March 1	**L13.** Eruptions: Products & Types, Explosivity Scales	(7)
11	March 6	**L14.** Calderas, the really big ones	(7)
17	March 6	Spring Break	
18	March 8	Spring Break	
19	March 13	**L15.** Submarine Lavas, Hot Spots, Flood Basalts	(7)
20	March 15	**L16.** Historic Eruptions I. Vesuvius 79, Tambora 1815, Mt. Pelee 1902	(8) paper due
21	March 20	**L17.** Historic Eruptions II. Krakatau 1883, Pinatubo 1991, Unzen 1991	(8)
22	March 22	**L18.** Historic Eruptions III. Mt. St. Helens 1980, Popo 2000, Lengai	(8)
23	March 27	**L19.** Historic Eruptions IV. Laki 1783 & Kilauea 1983-2004	(8) journal II due
24	March 29	**Exam II:** Plate Tectonics & Volcanoes	

Part III. Synthesis & Relationships

25	April 3	**L20.** Extraterrestrial Volcanism & Impacts-Out of this world	(16)
26	April 5	**L21.** Seafloor volcanism and EQ; sources of life and metals?	
27	April 10	**L22.** Volcanoes, Climate, & Extinctions	(303-306,437-442)
28	April 12	**L23.** Volcano Benefits: Energy, Diamonds & Gold	
29	April 17	**L24.** Importance of Volcanism and Seismicity-Risk	(1)
30	April 19	**Exam III:** Comprehensive, but emphasizing Part III	