**August – December, 2005**

# ISNS 4359 Earthquakes and Volcanoes

**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 for 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.

**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. There are two 75 minute-long lectures per week with as active student discussion as possible, supplemented by rocks, 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.

**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.

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

I have ordered the book at the on-campus bookstore and at Off-Campus Books. However, it is cheaper through Amazon.com ($83.13).

**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 or on the WebCT discussion page, and contributing current events and humorous items related to earthquakes and volcanoes in the news.

**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 after each class through WebCT to summarize class content and to fill any textbook gaps.

**Problem Sets:** Due by the end of class on the due date. No credit for tardy assignments, unless special arrangements have been made with the instructor prior to the due date. Two Journals (I & II) will be due by the end of class on dates to be specified. 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.

**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 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 22 Sept 05 to eliminate the possibility of duplication). Paper details, expectations, topics, sources, etc. will be provided when assigned on 8 Sept 05v.

**Grading:** You can keep track of your grades by checking the course WebCT page (link available on the UTD homepage or webct.utdallas.edu). 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. 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%) |
| “Journals” (50 pts each) | 100 | (17%) |
| 2 Problem Sets, 25 points each | 50 | ( 8%) |
| 1 original paper | 100 | (17%) |
| Class participation | 50 | ( 8%) |
| Extra Credit 5 pop quizzes, 10 points each | 50 | (up to +8%) |

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| 1 | Aug 23 | **Lecture i,** Course Introduction & Overview of Natural Disasters | (ch. 1) |

**Part I. Quakes & Plates**

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|---|---|---|---|
| 2 | Aug 25 | **L1.** Matter, Earth, sources of energy | (ch. 2) |
| 3 | Aug 30 | **L2.** Plate Tectonics | (3: 50-75) |
| 4 | Sept 1 | **L3.** Faults & Seismic Waves | (4: 78-91) |
| 5 | Sept 6 | **L4.** Seismograms, Locating EQ, EQ Magnitude, Intensity, & Recurrence assign PS1 | (4: 92-105) |
| 6 | Sept 8 | **L5.** Seismology; First Motions, Man-made seismicity; Tsunami assign paper | (4: 106-113) |
| 7 | Sept 13 | **L6.** Modern EQ – Sumatra, Dec 2004 | |
| 8 | Sept 15 | **L7.** Historic EQ I. Lisbon 1755, SF 1906, AK 1964 | (78-79, 123-125, 116-117) PS1due |
| 9 | Sept 20 | **L8**. Historic EQ II. Loma Prieta 1989, Northridge 1994 | (142-3,157-161) |
| 10 | Sept 22 | **L9.** Historic EQ III. Kobe 1995, Izmit 1999; Bam 2003 | (135-136, 70-71, 4-5) paper topic due |
| 11 | Sept 27 | **L10.** Historic EQ IV. New Madrid 1811-1812 | (6) journal I due |
| 12 | Sept 29 | **Exam I:** Plate Tectonics & Earthquakes | |

**Part II. Volcanoes & Plates**

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|---|---|---|---|
| 13 | Oct 4 | **L11.** Magma, Lava, & Plate Tectonics | (ch 7) |
| 14 | Oct 6 | **L12.** Continental Volcano Architecture | (7) |
| 15 | Oct 11 | **L13.** Eruptions: Products & Types, Explosivity Scales | (7) |
| 16 | Oct 13 | **L14.** Calderas, the really big ones | (7) assign PS2 |
| 17 | Oct 18 | **L15.** Submarine Lavas, Hot Spots, Flood Basalts | (7) |
| 18 | Oct 20 | **L16.** Historic Eruptions I. Vesuvius 79, Tambora 1815, Mt. Pelee 1902 | (8) paper due |
| 19 | Oct 25 | **L17.** Historic Eruptions II. Krakatau 1883, Pinatubo 1991, Unzen 1991 | (8) PS2 due |
| 20 | Oct 27 | **L18.** Historic Eruptions III. Mt. St. Helens 1980, Popo 2000, Lengai | (8) |
| 21 | Nov 1 | **L19.** Historic Eruptions IV. Laki 1783 & Kilauea 1983-2004 | (8) journal II due |
| 22 | Nov 3 | **Exam II:** Plate Tectonics & Volcanoes | |

**Part III. Synthesis & Relationships**

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|---|---|---|---|
| 23 | Nov 8 | **L20.** Extraterrestrial Volcanism & Impacts-Out of this world | (16) |
| 24 | Nov 10 | **L21.** Seafloor volcanism and EQ; sources of life and metals? | |
| 25 | Nov 15 | **L22.** Volcanoes, Climate, & Extinctions | (303-306,437-442) |
| 26 | Nov 17 | **L23.** Volcano Benefits: Energy, Diamonds & Gold | |
| 27 | Nov 22 | **L24.** Importance of Volcanism and Seismicity-Risk | (1) |
| 28 | | **Exam III:** Comprehensive, but emphasizing Part III | |

Final exams: Section 001 – 8 am, Thursday Dec 1
Section 002 – 2 pm, Thursday Dec 1