VOLCANOLOGY: MAGMATIC AND VOLCANIC PROCESSES

Purpose: This is an advanced undergraduate/graduate level class and content will be driven to a large extent on enrollment. The course will consist of a series of lectures to provide a foundation for discussions on topics of interest. The intent is to give the student a broad introduction to magmatic and volcanic processes and their associated hazards. Emphasis will be placed on applying basic physical and chemical principles to understanding volcanic systems.


Other readings will be taken from textbooks, monographs, the world-wide-web, and journal articles from the recent scientific literature. Selections from the following texts will be used in the first sections of class.


Grading: One 1 Partial Examination (non-cumulative - 30% of Final Grade); 5 page research paper proposal (10% of Final Grade); 15 page research paper (30% of Final Grade); Oral Presentations (20% of Final Grade); Periodic Homework Sets (10% of Final Grade).

Inclement Weather Policy: Lecture will be cancelled if Fayetteville Public Schools are closed. Assignments/tests will be due or rescheduled for the next meeting.
Tentative topics and exam schedule:

**Part I: Planetary Scale Energetics and Structure of the Earth**

- Plate Tectonic Introduction and Review
- Energy, Work, and Heat Transfer Basics
- Earth’s Global Heat Budget
- Tectonics and Volcanism
- Basalt Petrogenesis on Earth and other Terrestrial Planets

**Part II: Silicate Melts and Magma Transit and Storage in the Crust**

- Introduction to Thermodynamics and its Variables
- Conditions for Heterogeneous Equilibrium
- The Effect of Volatiles on Magmatic Systems
- The Nature of Silicate Melts: Magma Viscosity and Rheology
- Geochemistry and Geochronology: Tools and processes
- Volcano Geophysics: Earthquakes, Imaging techniques, and Deformation

**Part III: Volcanoes, Volcanic Activity, and Hazards**

- Quick Overview of Several Classic Eruptions:
  - Vesuvius, AD 79; Krakatau, 1883; Mt. Pelée, 1902; Mt. St Helens, May 1980
- Types and Methods of Classification of Volcanic Activity
- Lava Flows
- Volcanic Landforms and Morphology
- Mechanisms of Pyroclastic Eruptions: Volatiles revisited
- Characteristics of Pyroclastic Fall, Flow, and Surge Deposits
- Debris Flows and Lahars
- Cauldrons, Caldera Complexes, and Mega-eruptions
- Volcanic Hazard Mapping and Mitigation
- Volcanic Impact on Climate

**Part IV: Current Topics in Volcanology**

- The Current Eruption of Soufriere Hills Volcano, Montserrat
- Renewed Volcanic Activity at Mt. St. Helens since 2004
- Student Presentations on Individual Research Topics and Class Discussion

**Research Topic Proposal Due (Thursday, February 26th, 2009)**
**Partial Lecture Examination (Thursday, March 5th, 2009)**
**Final Research Paper Due (Monday, May 4th, 2009)**

*This syllabus is subject to change. Any changes will be discussed and outlined in class.*