SEMESTER AT SEA COURSE SYLLABUS

Voyage: Spring 2014
Discipline: Environmental Science
EVSC 3559: Geologic Hazards
Division: Upper
Faculty Name: Gary Griggs

COURSE DESCRIPTION

The distribution, recognition, evaluation, and impacts of geologic hazards.

Plate tectonics, earthquakes and faulting; volcanism, asteroid impacts, and tsunamis; landslides and mass movements; coastal erosion and inundation; subsidence, settlement and hazardous soils conditions; hydrology and flooding; hurricanes and Nor'easters; climate change and impacts. The role of hazardous and catastrophic geologic processes in shaping Earth and in impacting people and communities; hazards and risks; land use planning and hazard mitigation.

COURSE OBJECTIVES

To provide a clear, understandable and comprehensive description of the causal factors and global distribution of the most common geologic hazards as will as their significance and impacts on the lives of people around the world.

REQUIRED TEXTBOOK

AUTHOR: Donald and David Hyndman
TITLE: Natural Hazards and Disasters
PUBLISHER: Brooks/Cole
ISBN-10: 1133590810; ISBN-13: 978-1133590811
DATE/EDITION: 4th edition due Jan. 2013

TOPICAL OUTLINE OF COURSE (Chapters based on 3rd edition); 4th edition coming

DATE	TOPIC	READING
Jan 12	Introduction to Course and Syllabus: Organization and Scope; An Introduction to Natural Hazards and Disasters.	Chap. 1
Jan 14	Some basics about the Earth, geologic materials & time; Plate Tectonics and Physical Hazards	Chap. 2
Jan 16	Plate Tectonics; Volcanoes: characteristics & distribution	Chap 2 & 6
Jan 17	***Hilo, Hawaii- Field Trip January 17***	
Jan 19	Volcanic hazards: risks, eruption prediction and adaption	Chap. 7
Jan 22	Faults and Earthquakes	Chap. 2
Jan 25	Earthquakes: Processes, impacts and global examples	Chap. 3
Jan 27	Tsunamis: Generation, properties & coastal impacts	Chap. 5

Jan 29-Feb 3	***Yokohama and Kobe, Japan***	
Feb 4	Tsunamis: Global examples (Cascadia 1700; Indian Ocean 2006; Japan 2011)	Chap. 5
Feb 6-11	***Shanghai and Hong Kong***	
Feb 12	Earthquake prediction, paleoseismology; mitigation and adaptation	Chap. 4
Feb 14-19	***Ho Chi Minh, Viet Nam***	
Feb 20	Landslides and other downslope movements: types of movement, causes of slope failure	Chap. 8
Feb 22-23	***Singapore***	
Feb 24	Landslide impacts; global examples; damage and responses	Chap. 8
Feb 27-Mar 4	***Rangoon, Myanmar***	
Mar 5	Land subsidence: causes and impacts; solution and sinkholes	Chap. 9
Mar 7	Soils and problems: soil formation and erosion; expansive soils	Chap. 9
Mar 9-14	***Cochin, India***	
Mar 15	Rainfall, stream flow and flooding	Chap. 11
Mar 18	Floods and global examples	Chap. 11/12
Mar 20	Approaches to flood control or mitigation	Chap. 12
Mar 21	***Port Louis, Mauritius***	
Mar 23	Coastal processes and hazards	Chap. 13
Mar 26	Coastal protection; beaches and human impacts	Chap. 13
Mar 28- Apr 2	***Cape Town, South Africa***	
Apr 3	PDO, ENSO, and hurricanes	Chap. 14
Apr 5	Climate change: consequences of global warming	Chap. 10
Apr 8	Sea-level rise: processes, rates and impacts	Chap. 10
Apr 10-14	***Accra, Ghana***	

Apr 15	Adapting/Responding to sea-level rise	Chap. 10
Apr 17	Asteroid impacts;	Chap. 17
Apr 20	Hazards & risks; Adaptation and mitigation	Chap. 18
Apr 23-27	***Casablanca, Morocco***	
April 28	**Final Exam**	

FIELD WORK

The geologic settings of Hawaii provide an excellent opportunity for observing volcanic hazards and their impacts first hand, as well as the risks from tsunamis. The Hawaiian Islands owe their existence to volcanic activity over a hot spot beneath the Pacific tectonic plate, which has moved northwest over time. As a result, volcanism has move southeast over the past 40 million years. The islands of Maui, Oahu, Molokai and Kauai are progressive older and now inactive, while the big island of Hawaii remains active with Kilauea still actively erupting. Thus the island affords an excellent opportunity to observe active volcanism, it's landforms and effects firsthand. The Hawaiian-Emperor seamount chain owes its entire existence to the presence of a hot spot in the underlying asthenosphere that has been active for at least 80 million years, and has given rise to over 100 volcanoes stretching for 3000 miles from the island of Hawaii to the Aleutian Trench. The big Island of Hawaii is ground zero for active volcanism with the East Rift of Kilauea frequently erupting, and Hilo being devastated many times historically by tsunamis, and Kilauea a volcano that you can hike into and walk across the crater floor with steam still arising and past eruptions evident.

FIELD ASSIGNMENTS

The day long field trip will take place within the Hawaii Volcanoes National Park and will include a visit to the Jaggar Museum that has displays of equipment used by scientists in the past to study the volcano, working seismographs that can detect motion below the surface prior to an eruption, and a view of the main crater of Kilauea, one of the world's most active volcanoes. We will then travel to and hike through the Thurston Lava Tube, a cave formed 500 years ago when an active lava flow developed a thick cool roof and sides and then drained, leaving behind a tunnel large enough to drive a car through. We will then hike along Devastation Trail, which is a paved path through a forested area that was devastated by falling ash and pyroclastic material from the spectacular lava fountain of the 1959 Kilauea Iki eruption. Hike to Lua Manu Crater, a collapse pit crater formed when lava drained out of a subsurface chamber causing the surface to collapse.


Devastation Trail

The assignment here is to observe, photograph and or sketch these features and put the Hawaiian Islands and their geology into the larger picture of the Hawaiian Hot Spot and Pacific Basin plate tectonics.

Students would be evaluated based on a paper, with descriptions and photographs or sketches of the particular landforms or geomorphic features, which should provide evidence supporting their observations and findings.

METHODS OF EVALUATION / GRADING RUBRIC

Student grade will be based on 3 quizzes (35%), a paper based on the field assignment (20%), class participation (attendance, engagement in class discussion) (15%) and a final exam (30%).

HONOR CODE

Semester at Sea students enroll in an academic program administered by the University of Virginia, and thus bind themselves to the University's honor code. The code prohibits all acts of lying, cheating, and stealing. Please consult the Voyager's Handbook for further explanation of what constitutes an honor offense.

Each written assignment for this course must be pledged by the student as follows: "On my honor as a student, I pledge that I have neither given nor received aid on this assignment." The pledge must be signed, or, in the case of an electronic file, signed "[signed]."